POPULAR MECHANICS

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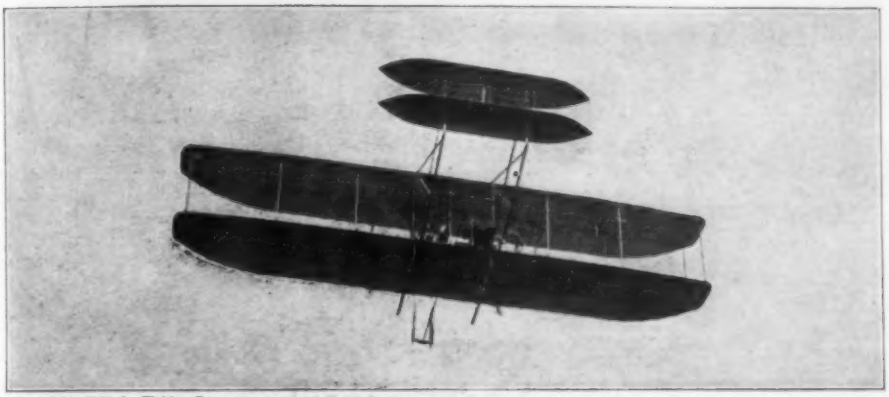

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Wright Aeroplane in Full Flight Before the Accident—Speed, 38 Miles Per Hour—Altitude, 300 Ft.

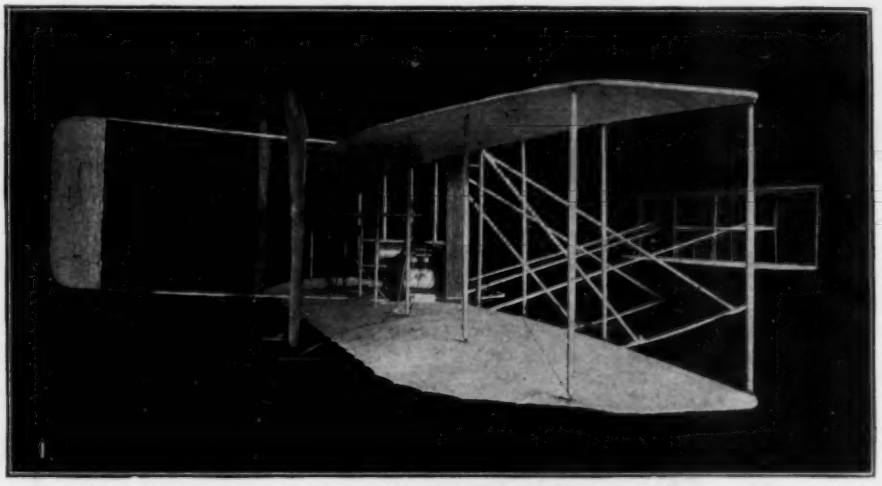
SEPTEMBER A MEMORABLE MONTH IN AERIAL NAVIGATION

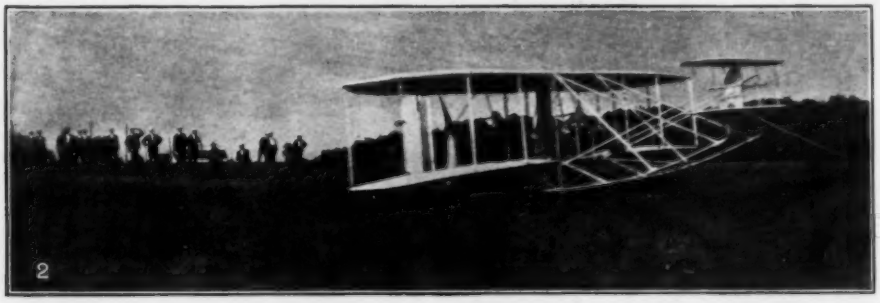
Orville Wright Breaks All World's Records at Fort Myer, but Ends with a Disaster which Kills Lieut. T. E. Selfridge and Seriously Injures Himself—Four Days Later Wilbur Wright Makes a Still Greater Flight in France to Cheer His Injured Brother

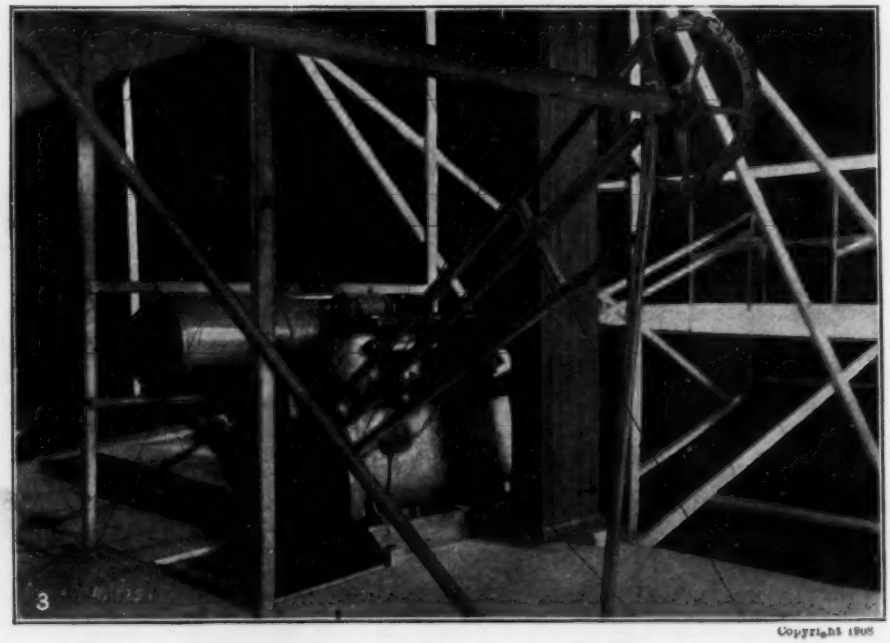
The sacrifice demanded by science for success is often death, and it is unreasonable to expect that man's persistent effort to conquer the air should be triumphantly advanced without the blood price which always has and always will be inevitable in the struggle to evolve new ways and means of conquering natural forces by mechanical agencies.

It is also unreasonable to believe that such deaths should be a severe setback to continued activity and advancement, other than in the sense that they take from the field of endeavor men whose knowledge and bravery aid in the solving of the difficulties which block the paths of science.

If such were the case, and men withdrew from the struggle because of the danger, the world would not have progressed as it has. In every branch of mechanical science the beginnings have been fraught with dangers and victory has meant the spilling of blood. During the years which followed the discovery of the force in steam, scientists







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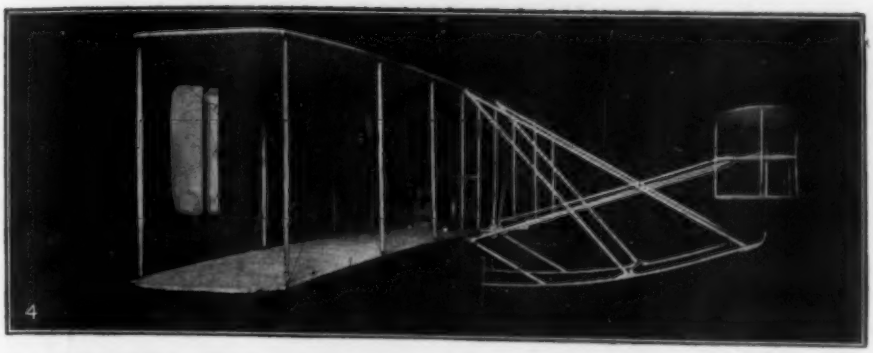
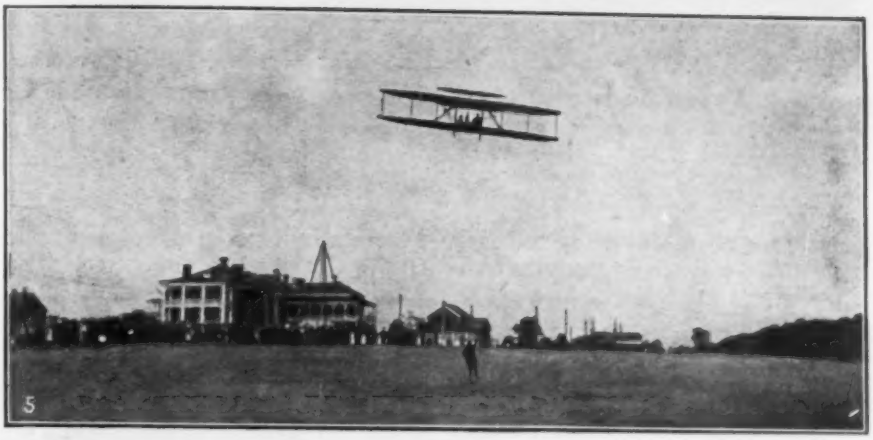
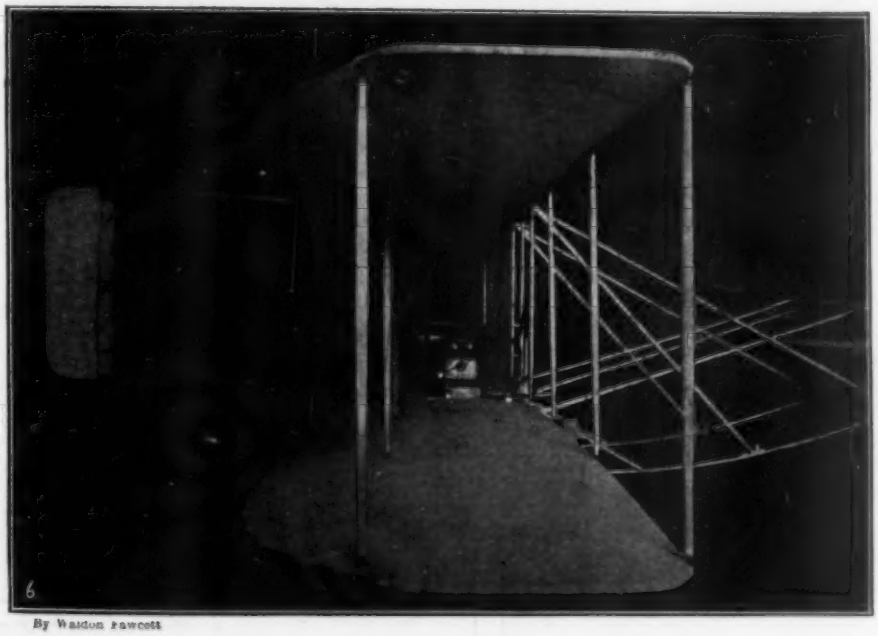
Wright Aeroplane at Ft. Myer: 1—View Showing Propellers at Rear; 2—Beginning a Flight; 3—Engine and Power Transmission Gear







By Waldon Fawcett

4—View Showing Front of Aeroplane; 5—Flying Over Ft. Myer; 6—Close Range View Showing Mechanical Details

studied and experimented to find ways and means of utilizing it to do the work of men. Many were killed or injured because the principle involved was new and they had not yet learned to judge its force, but the others did not stop investigating because such experiments were dangerous. So it has been with every advancement which has had to be evolved from a fundamental principle. Natural gas was shunned for many years after its discovery because of its unknown dangers, new explosives claim their victims, new types of big guns explode with fatal results, and in the every-day industrial world the list of deaths and injuries is appalling. The construction of every huge skyscraper claims an average of at least three victims, and of the 19,000,000 industrial workers in this country, 500,000 are killed or maimed every year—yet the construction of skyscrapers does not cease and the 18,500,000 uninjured workers labor on.

Lieut. Thomas E. Selfridge was killed in his efforts to advance the science of aviation. In his death the United States army loses an ardent student who made himself familiar with the whole progress of that science in the interest of his country.

Events moved swiftly in aeronautics during the month of September, with the result that in coming centuries the year 1908 will stand out well defined as a period of great achievement in the science of aerial flight. It is needless to state that the men responsible for this making of history were Orville and Wilbur Wright, the former at Fort Myer and the latter in France. The activities started with a flight at Fort Myer on September 9, which lasted 57 min. 31 sec., the longest flight ever accomplished by a heavier-than-air flying machine. The world heard of it a short time after, turned its face in the general direction of the United States, and gasped, but the first surprise was hardly completed before it had to applaud again, for a couple of hours later Orville Wright made a second flight, which continued 1 hr. 2 min. 15 sec. Not content with this second demonstration, he went up a third time, carrying Lieut. Lahm, and stayed in the air 6 min. 26 sec., thereby breaking all world records for two-man flights.

For two days longer the world continued to follow in amazement the wonderful flights of the Wright aeroplane, then came five days of inactivity, and on the eighth day the world gasped again, but in horror—the aeroplane had fallen, killing Lieut. Selfridge and seriously injuring Orville Wright. The flight on September 10 lasted 1 hr. 5 min. 52 sec., the field being circled 58 times. The flight on September 11 lasted 1 hr. 10 min. 26 sec. All the flights were made at an average speed of 38 miles an hour.

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Wreck of the Wright Machine, Showing Broken Propeller Which Caused Wreck

Several days before the fatal flight Orville Wright had announced that he would take Lieut. Selfridge with him. At 5:14 Thursday afternoon, September 17, the machine was released and rose to a height of 40 ft. on the first round. On

the second round it rose to a height of 75 ft., and continued at that elevation until the accident occurred at the end of the third circuit of the field. Then something was seen to fall, the aeroplane turned over on its left side despite the attempts of Orville Wright to stop it, and, pausing a moment, made a complete turn and swooped down to earth in a cloud of dust. The cause of the accident was the breaking of a propeller blade.

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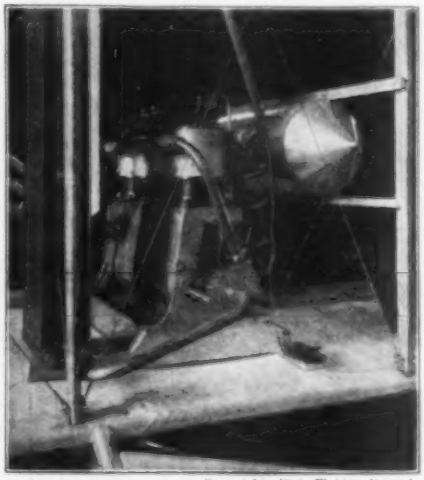
Removing Lieut. Selfridge from the Wreck

Soldiers and spectators ran across the field and assisted in lifting Mr. Wright and Lieut. Selfridge from under the tangled mass of machinery, rods, wires and shreds of muslin. Lieut. Selfridge was unconscious. His head was covered with blood, and he was choking when the soldiers extricated him. He died in the Fort Myer hospital early in the evening. Orville Wright suffered a fracture of the left thigh and four ribs broken. Four days later Orville Wright told how the accident occurred:

"It can never happen again," said Wright. "I know how it happened from a certain point. The propeller struck a wire guy and one of the blades broke off. Then we commenced to spin around, the unbroken propeller urging us onward. I cut off the motor and we lost headway, but the rudder was out of commission and we were falling edgewise. The only way to get headway was to fall, but we didn't have far enough to fall. It started to right; 20 ft. more and it would have righted; but we didn't have the 20 ft."

At this period comes the most wonderful flight of all. On the same date that the above interview was given out, September 21, Wilbur Wright in France determined to try for a record flight, believing that it would cheer his brother. He made the ascent at Le Mans late in the afternoon in the presence of American Ambassador White, the officials of the French Aero Club, a number of French generals, and 10,000 spectators. When he at last landed he had been in the air 1 hr. 31 min. 58 sec., covering an estimated distance of 61 miles. This marvelous flight will, in all probability, win for the Wright brothers the Michelin cup for the greatest distance covered by an aeroplane in 1908, and the Aero club prize of $1,000 for the longest flight over an inclosed ground.



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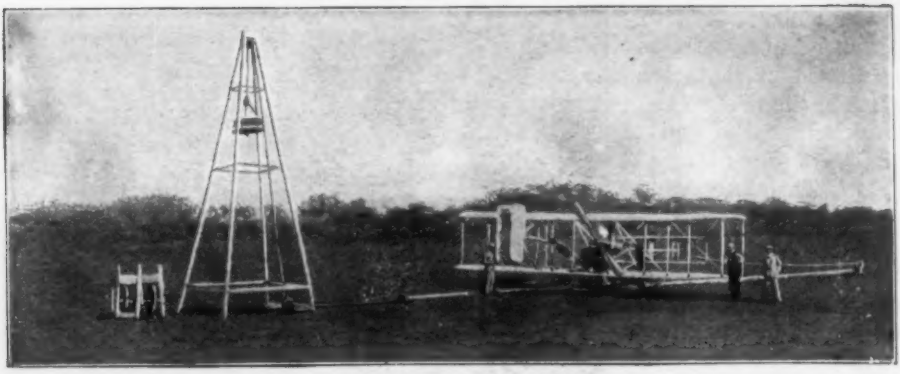
Curtis Engine on Wright Aeroplane



A Weight Running Down Starts the Machine in Flight

At the end of the flight Ambassador White told Wilbur Wright that he knew he was expressing the sentiments of the entire American people in congratulating him. He also said that he believed the American people should present a testimonial to the brothers as men who have opened a new page in the history of the world.

The tests at Fort Myer had, of course, to be discontinued after the regrettable accident of September 17, but as soon as Orville Wright is well again and the machine is rebuilt, the tests will be continued. The interest the United States government was taking in the tests was clearly shown by the distinguished gathering on the field during the earlier flights. The government party included Secretary of War Wright, Secretary of the Navy Metcalf and Secretary of Commerce and Labor Strauss, together with practically every army officer holding an important executive position in the War Department. Among them were five Brigadier Generals.

The whole world regrets that such a sad accident should have marred such wonderful flights, and Lieut. Selfridge's name will be remembered as that borne by a martyr, sacrificed in the name of science. The young officer had a brilliant prospect before him and had expected in the near future to operate the first heavier-than-air flying machine of the U. S. army.

THE AEROPLANE AND THE BATTLESHIP

Many people are now looking forward confidently to the time when the aeroplane will consign the navies of the world to the scrap heap, but these huge and costly instruments of war have so far been able to hold their own, and it will probably be a very long time before any such radical hope will be completely realized.

At one period in the development of submarines it was confidently predicted they would seal the doom of battleships. In both actual war and naval practice, searchlights, nets, greater speed and even stormy seas have given the battleship unexpected means of defense and escape. Guns will shortly be in service specially constructed and carrying shot for the defense of battleships against airships; and while an aeroplane or dirigible may not be an easy mark at high altitudes, neither is the battleship a sure target. In the daytime each can see the other; at night all lights on board ship can be concealed save only the funnels, and with the substitution in the near future of gas engines for steam, even this betraying feature will be removed.

To drop explosives on a city is one thing, but to hit a battleship is quite another. Such an event would not be a calamity, however. It would put a stop to vast expenditures for naval

armaments, succeeding where international peace congresses have failed. Even if every important nation should go headlong into the business of constructing fleets of aeroplanes, the result could not possibly be made as expensive as battleships.

DIRIGIBLE AIRSHIP RACE IN GERMANY

With Count Zeppelin and his huge dirigible airship out of the race for the supremacy of the air in the lighter-than-air class of aerial craft, the other German aeronautics experts are having an opportunity to absorb public interest. Major Von Parseval and Major Gross both have wonderful dirigible balloons, and it is not at all improbable that before Count Zeppelin is again ready to enter the race, his records may be beaten.

On September 16 the Parseval and Gross dirigibles started out from their sheds near Berlin to see which could reach Dobritz first. This is claimed to be the first race in which dirigible airships, starting at the same time, have tried to beat each other to a given goal. Emperor William and the Empress, attended by a numerous suite, awaited the finish of the race at Dobritz, but both dirigibles met with minor accidents and the race had to be discontinued. The Parseval airship was struck by a squall while crossing the Halen and one of the rods holding the basket broke. The end of the rod tore a hole in the gas bag and Major Parseval thought it wise to stop the motors and descend.

Major Gross, whose dirigible is of the semi-rigid type, fared much better, but half an hour later when near Potsdam he saw he was losing headway against the high wind and returned to his station.

Both airships made magnificent endurance flights during September. The Parseval stayed up for 13 hours and the Gross for 11¼ hours.

A STREET OF STEPS

A peculiar street is found in Brussels, consisting entirely of steps. It is,

For Pedestrians Only

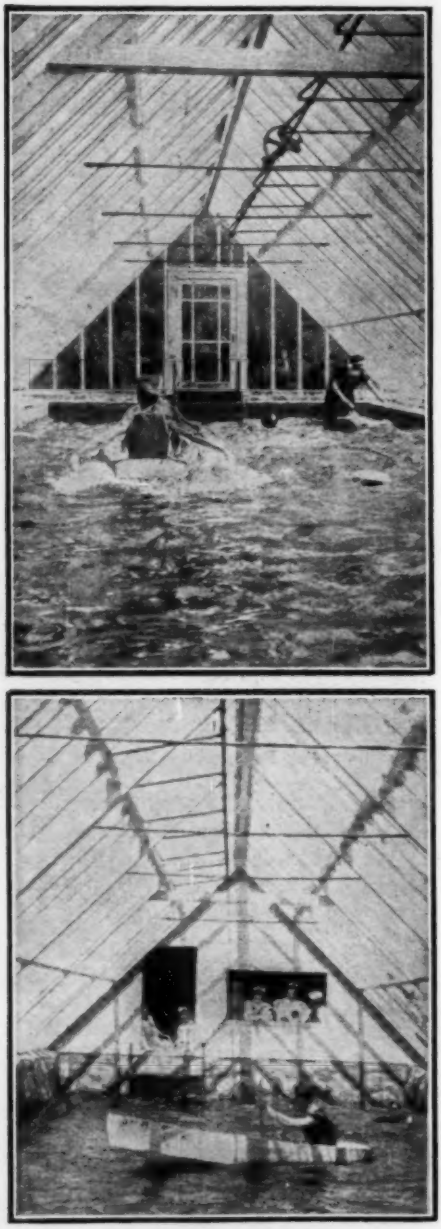
of course, only for pedestrians, and probably represents the longest flight of stairs in the world. Benches are placed at intervals on which persons mounting the street can rest.

RECLAIMS 12,000,000 ACRES

Since 1902, when the Federal Reclamation Act was passed, the government has added 5,000,000 acres to the country's habitable land, and these, added to the 7,200,000 reclaimed from the desert before that year, make an increase of 12,000,000 acres in the country's habitable area; an average of 2,000,000 acres per year.

GREENHOUSE CONVERTED INTO A SWIMMING TANK

This illustration from England suggests the conversion of greenhouses into swimming tanks when flowers will not grow. This greenhouse was lined with stone in preparation for its new rôle, and the stone acted as a foundation for cement and tar-paper, brickwork and light tiles. By dint of excavation the tank was given a depth of from 4 to 12 ft. The spectators' box was once the potting shed. The water is warmed when necessary by the hot-water pipes that were in the greenhouse as originally constructed.



Sun and Water Bathing

ARMING SAFES WITH DEADLY GASES

A chemical company has devised a grenade or glass receptacle, filled with a chemical compound, as a means of making it impossible for safe-blowers to rob a safe after breaking it open.

It is an inoffensive looking article, about 2 in. in diameter and 5 in. long. Inside of the exterior tube are seven smaller ones, each filled with a different chemical. When the door of the safe is blown, or the safe is jarred heavily, the grenade explodes, and the air is filled with the deadly fumes. It is claimed that these fumes, which, so far as effect is concerned, are not unlike the gases from the deadly Chinese "stink pots," are powerful enough to make breathing impossible and to force all persons near the safe to retreat or be almost instantly suffocated.

The grenades are made with a lasting effect of from 6 to 10 hours, depending upon the size, and are placed just back of the locking mechanism of the safe doors.

OIL TO BE PIPED OVER MEXICAN MOUNTAINS

One of the greatest engineering feats ever attempted in the construction of oil pipe lines is involved in the work that has been started by a Mexican petroleum company for the purpose of connecting Mexico City with the oil wells in the low coast country near Tampico.

This line will have to climb the mountains to an altitude of 10,000 ft. within a distance of not more than 50 miles. After reaching this great height

it will be laid up and down the mountains for another 100 miles before it reaches the great central plateau. It will then drop to the Valley of Mexico, which is a little less than 8,000 ft. above the sea level.

The object of building such a line is to supply Mexico City with fuel oil. Coal and other fuel is very expensive there, and it is claimed that the demand for fuel oil fully justifies the great expense of such a line. It is stated that the raising of oil up the mountains to a height of 10,000 ft. is entirely feasible, and all that is required for success is an ample number of pumping stations.

METEOR HOLDS UP A TRAIN

A train was recently stopped in Nevada by a meteor, the light from which was mistaken by the engineer for a signal of some sort. The meteor, which was described by the engineer and passengers as being as big as a house, crossed the tracks just ahead of the train with a brilliant, dazzling light that blinded the eyes for a number of seconds.

REMARKABLE CAVERN IN FRANCE

The fact that the small opening at the top of this extraordinary cavern is on a level plain with no surrounding basin makes it impossible that it could have been hollowed out by water flowing in from above. The only possible theory is that it must have been cut out through many ages from the bottom to the top by the circling flow of an underground stream. This stream, working first in a small chasm, hollowed out the great cave by hydrostatic pressure.

The height of the cavern from the top of the mound is 99 ft. Its length is 180 ft. and its breadth 120 ft. The extreme depth is 471 ft. The huge mound in the center, forming a core of loose stones and debris, is used as an exhibition floor. Tourists are let down in a basket worked by a windlass, and for their benefit the vault is illuminated with magnesium light.

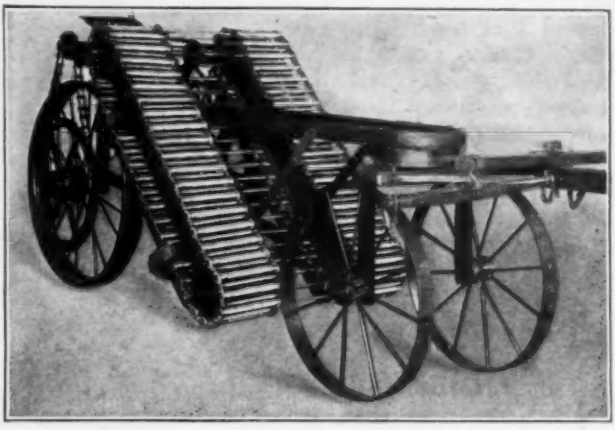
Lowering Tourists in Baskets

MACHINE ON ENTIRELY NEW PRINCIPLE PROMISES TO REVOLUTIONIZE COTTON PICKING

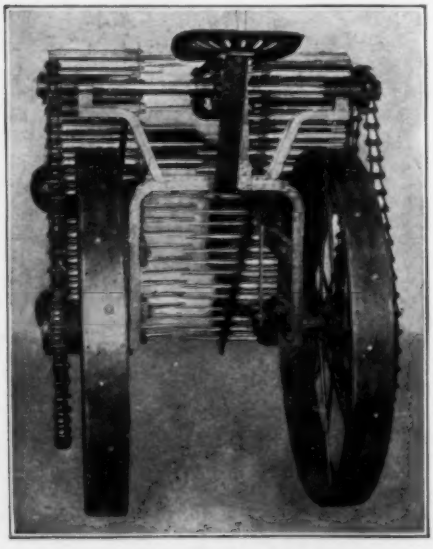
It is claimed by men who have had enough experience to know that the mechanical picking of cotton, without doubt one of the most important agricultural problems of the day, is about to be solved by the newly patented machine described in this article. Modern machinery has reduced the labor required to produce a bushel of corn from 4 hours to 34 minutes, and wheat from 3½ hours to 10 minutes, but up to the present time cotton is being picked by hand as in the beginning, notwithstanding the efforts of scores of inventors to devise a practical cotton-picking machine.

The great difficulty which has barred success, and which it is claimed this machine has gained a victory over, is the fact that cotton, unlike cereals, does not ripen uniformly, and therefore cannot be harvested indiscriminately. Only the ripe cotton must be taken, and the plant with its leaves and green bolls must be left unharmed after the machine has passed through.

Such a demand would seem, at first thought, to be a foolish appeal for almost human intelligence in a mechanism of steel, yet all tests seem to positively prove that the machine can do this. In the demonstrations rose bushes have been run through the machine without harm to full-blown roses or buds. Sticks of oak wood three and four feet high have been set in among plants and the strippers ran through the rigid sticks and the yielding, pliable, growing plants equally well. This is possible because the movement of the pickers is perpendicular, and it is because of this perpendicular movement that the machine is expected to be a success where other machines have failed.



General View of Cotton Picker



End View Showing Spindles

The machine consists of a frame on four wheels and two chain elevators placed on the frame at an angle of 45 degrees. The machine is pulled over the ground by horses, and the forward movement of the entire machine is compensated for by the backward movement of the elevator chain, and these two partly reverse movements create the third or perpendicular movement for

the pickers. The pickers or spindles, therefore, stroke the cotton plant directly upward.

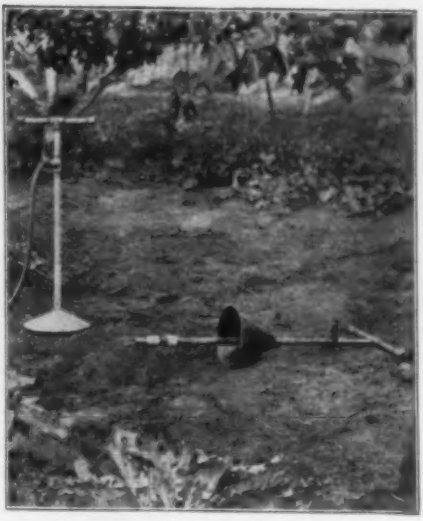
The chain elevators are made up of a series of tubes in each of which a picker or spindle is concealed. These pickers are bayonet-shaped, their three edges being provided with horse-hair teeth. As the machine moves forward the chain moves around the sprocket wheels, and at the bottom of the elevator a cam, placed diagonally across and under the chain, catches the pickers and pushes them out of the tubes into the lower part of the cotton plant. Each picker is provided at its base with a small gear wheel, which engages with a toothed rack and revolves as the picker comes out of the tube. At the top of the elevator a second cam catches the pickers and forces them back into the tubes again, this movement also stripping them of the cotton and dropping it into a conveyer.

The picking spindles, with their horse-hair teeth, seem to search out the ripe bolls and take the lint from them without damage to the fibre and seed, and without injuring the flower, plant or unripe bolls. This is because the pickers have no affinity for anything but the ripe cotton protruding from the bolls.

In actual operation the machine straddles the row to be picked, the chain of tubes containing the pickers being easily adjusted to pick in high or low cotton. The pickers revolve rapidly through the plant from the bottom upward, reaching in and through every part of it. Instantly they touch the ripe bolls the lint is pulled therefrom and carried up the elevator until it is dropped into the conveyer by the movement which forces the pickers back into the tubes.

A DEVICE THAT WATERS THE ROOTS OF PLANTS

This device, which is used to force water down to the roots of growing plants, has been patented by a San Diego, Cal., inventor. It is claimed

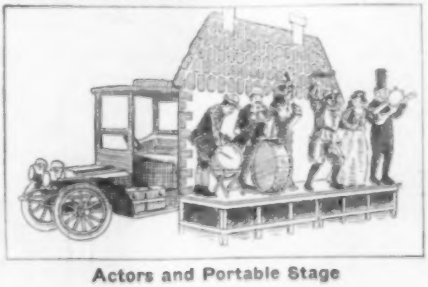


Device for Watering Roots

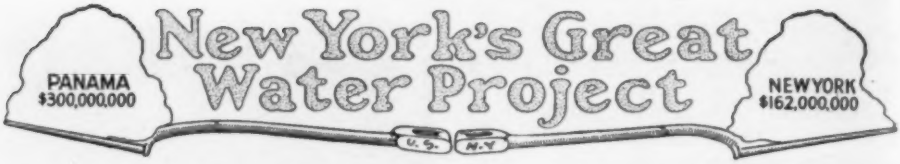
that wonderful crops are the result of its use. It is made of ¾-in. galvanized pipe with a ball valve at the end. When the end is inserted in the ground the projection lifts the ball valve and the water forces its way into the ground to a depth of about 2 ft. The sliding hood keeps the water from splashing the operator. The hose connection is made in the usual way, and fertilizer may be added to the water.

AN AUTOMOBILE OPERA IN FRANCE

A little troupe of famous singers is making a tour of the French watering places, where the members give performances in the open air for the benefit of deserving charities. They travel in an automobile, which also carries the portable stage shown braced against it in the illustration.



Actors and Portable Stage



Great River of Drinking Water Only Second to Panama Canal in Hugeness of Undertaking — Will Cost One-Third More Than the Suez Canal — More Than Eight Years Will Elapse Before It Is Completed — Nearly 1,500 Constables Will Be Necessary to Police Zone.

With such a wonderful engineering project under way as the Panama canal it is quite natural for the American people in general to lose sight for the moment of lesser engineering feats, but in New York an engineering project is being developed, which, in its hugeness, does not fall far short of the Panama canal, although its sole object is to furnish water to the city of New York.

The Panama canal is scheduled to unite the Atlantic and Pacific oceans at a date not later than 1915, and at a cost that will probably reach $300,000,000. The New York water system is scheduled to reach completion at about the same time, at a cost of about $162,000,000. A little over $100,000,000 has already been expended on the Panama canal, while, although close to $27,000,000 worth of work on the water system has been contracted for, no payments of any consequence have been made except for engineering fees. Within a few months, however, the contractors will have started their drain on the New York treasury, and from that time on the flow of gold from Father Knickerbocker's pocket will give that of Uncle Sam's interoceanic scheme a close race.

As finally agreed upon the Catskill water supply undertaking will traverse a total of 115 miles, composed of an aggregation of giant locks and dams connected by great open cuts and deep tunnels. All of the outlay of $162,000,000 will be devoted to impounding and delivering the waters of the Esopus, Rondout, Schoharie, and Catskill watersheds. The estimated daily yield of these sources is 660,000,000 gal., but for the present at least, only the product of the Esopus watershed is available. This is because of the decision of the State Water Supply Commission, which has excluded the other watersheds from being included. The Ashokan reservoirs, in the Esopus valley, however, are being constructed with the idea of taking care of the yield of all of these sources.

The Ashokan dam, which will create the greatest artificial reservoir in the world, is now under construction. The reservoir will imprison the waters of Esopus creek and Beaver Kill river, in Ulster county, 85 miles from the center of New York city, and will cover an area of 14,000 acres. At its nearest point to New York it will be 8 miles west of the Hudson at Kingston, and will extend inland a distance of 13 miles, with an average width of nearly a mile. In area the reservoir will be nearly equivalent to that of Manhattan island. At some points it will have a depth of 190 ft. and the average depth of water before the wastage begins to flow over the sills of the spillway will be 50 ft. This great reservoir, however, which will be capable of holding a volume of water sufficiently great to cover the surface of Manhattan borough to an average depth of 25 ft., represents only a total daily supply of one-half the maximum capacity of the entire system.

To make way for this reservoir 64 miles of public roadway and 11 miles of railroad tracks will have to be discontinued. The huge dams which will confine the water will measure 220 ft. from foundation to capstone, and will rise 610 ft. above sea level. The length of the dams will aggregate 3¾ miles. To provide an outlet for wastage in times of flood there will be a weir 1,000 ft. in width. When the reservoir is completed the bed of Esopus creek will be

Constructing the Great Aqueduct

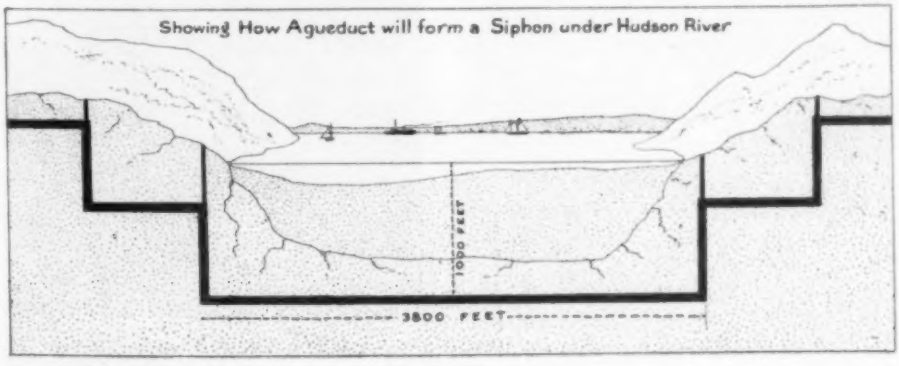
a dry gorge for the distance of 11 miles from West Hurley, where the big dam is located, to the Hudson. To provide for this contingency the city of New York is already paying for a change in the sewerage system of Kingston.

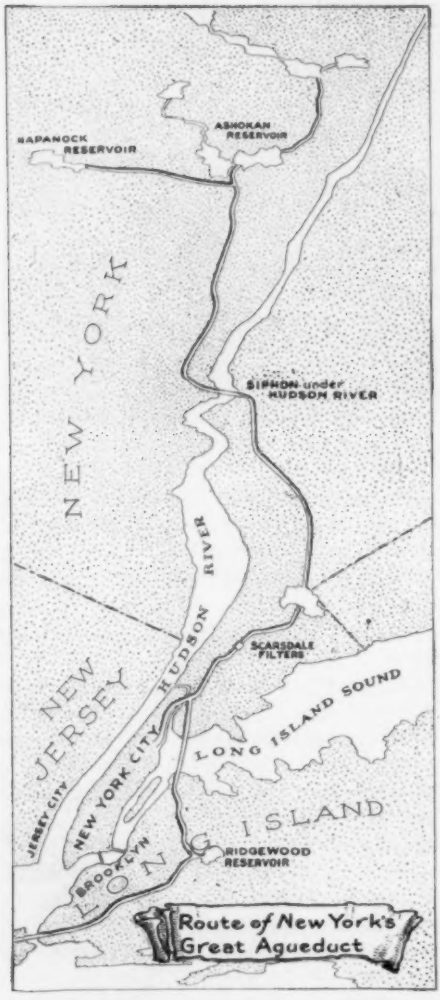
Siphons, and open and covered aqueduct constructions will eat up close to $100,000,000 of the entire expenditure. Two great siphons to carry the water under the valleys of Rondout creek and the Wallkill river must be constructed west of the Hudson. The contract for the Rondout siphon, which will be over four miles long, has already been awarded for $6,290,000.

Carrying the aqueduct under the Hudson river promises to be the great problem of the entire undertaking, there being no precedent to copy from. It is estimated that the Hudson siphon will lead the great river of drinking water down 1,000 ft. before a solid bed will be found on which it can rest. Test borings to find out just what the depth of the siphon must be have been carried on almost continuously for two years.

East of the Hudson the water supply will pass through a series of little hills and valleys that make the topoggraphy of the country like the teeth of a giant saw. Between the east bank and Hill View reservoir, back of Yonkers, where the main aqueduct will terminate, there will be 14 siphons. These depressions in the line will carry the subterranean waterway under small streams and marsh lands. The remainder of the work will be the comparatively simple cut-and-cover construction.

The Peekskill section, which is 9





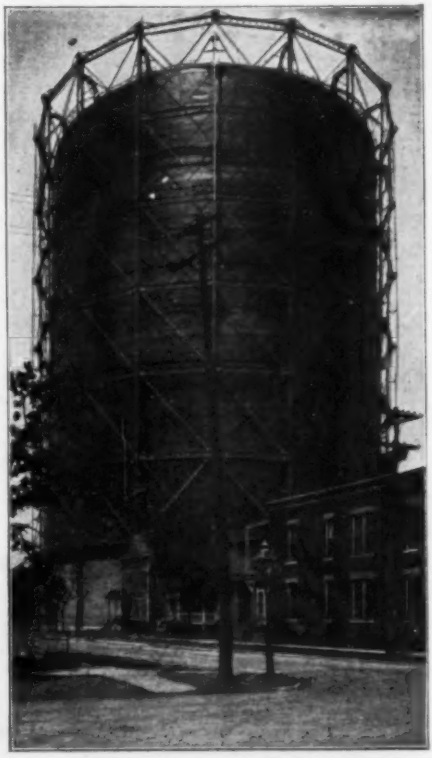
miles in length, will bring the water to the upper end of the present Croton watershed. If the demands of the city for an additional water supply are urged when the work is completed to that point, the Catskill-Esopus water can be turned into the Croton shed and sent through the existing aqueducts to New York while the work of completing the big reservoirs at Kensico and Hill View is in progress. It is intended, however, to eventually build a tunnel under the Croton lake.

Kensico Lake reservoir is to be enlarged so as to be capable of impounding 40,000,000,000 gal. of water on storage. This will represent two months' flow of 500,000,000 gal. a day, and will insure the city against famine should any accident occur along the line.

From Kensico the aqueduct will convey the river of water to East View reservoir, back of Yonkers, where great filter beds are to be laid out. The final stage will be through an aqueduct to the Hill View reservoir, just north of the city line.

SOMETHING LARGE IN GAS TANKS

One of the largest gas tanks in the world is located in the Englewood section of Chicago. Its diameter is 184 ft., its height, 268 ft., and its capacity is 5,000,000 cu. ft. The first section is 40 ft. high. The hugeness of the tank is well set off by the 2½-story house adjoining it.



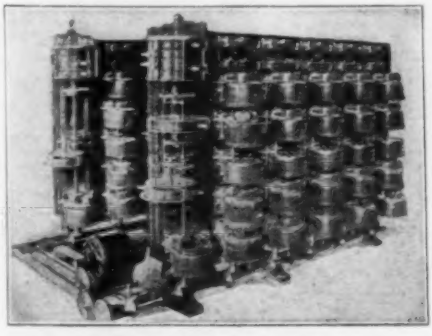
Height 268 Ft.; Diameter 184 Ft.

CANADIANS TAKE HOUSES WITH THEM

It is not an unusual sight in the great Canadian Northwest to see houses being transported long distances by train or towed across the many large lakes on scows, as the frontier Canadian usually takes his house with him when in search of a new place to locate, if transportation facilities make it possible. The illustrations show a number of wooden houses being transferred to a new site by rail and two views of lake scenes. In one of the latter a small rancher is crossing Lake Kootenay in search of a new dwelling-house, and towing his horses behind him, and in the other a house is being towed to a new location on another lake.

A COMPETITOR FOR THE TELEPHONE GIRL

This automatic telephone exchange, now being tried in Paris, saves telephone subscribers all trouble in asking for numbers, and, better still, is claimed to be infallible. Above the receiver of the telephone is an arrangement of four levers, with which the subscriber can make any numerical combination. For instance, if the subscriber wishes to call up 2682, he moves the levers until the numbers appear on the board before him. The act of making the combination is automatically communicated to a machine at the exchange called the decimal indicator. The machine, which is shown in the illustration, receives the number and picks up the corresponding contacts on a series of revolving drums. When all the contacts have been made the calling subscriber is in communication with the called.



The "Hello" Machine

The ten torpedo boat destroyers authorized in May will bear the names of naval officers who have distinguished themselves.

The above illustration shows the ingenious manner by which strikers in Paris evaded the law against public meetings. A meeting was to have been held at the Labor Exchange, but was forbidden by the Prefect of Police. The members rented the 30 rooms of the courtyard surrounding the hall, and at a given signal all the windows were thrown up, a multitude of heads appeared at each, and the speakers commenced the program.

A JAPANESE MONUMENT IN VIRGINIA

This memorial is one of the few monuments in the United States fashioned after a Japanese design and with

Japanese and English Inscription

a Japanese inscription, and the first to be erected in Virginia. It stands in a prominent location in Hollywood cemetery, Richmond, and by reason of its simple, massive lines and unique inscription has attracted much attention. It was erected at the expense of the Japanese government as a memorial to a commissioner and inspector in the bureau of the Japanese tobacco monopoly, who died while stationed at Richmond several years ago.

A NEW ASPHALT PAVEMENT CLEANER

A new pavement sprinkler and cleaner, designed for the purpose of cleaning asphalt surfaces, is being given an experimental test in New York. It consists of a watering tank behind which is a roller or "squeegee," to which stiff rubber strips are fastened in spiral fashion.

The machine is 12 ft. long and carries a 500-gal. water tank. The three

Asphalt Cleaner

sprinkling pipes are located between the front and rear axles, and the roller which does the sweeping is hung from the rear axles on a frame. The roller consists of a core 10 in. in diameter, into which the rubber strips are fastened. There are 24 of these strips, each $\frac{3}{8}$ in. thick, projecting $4\frac{1}{2}$ in. from the core. The fact that the strips are spirally placed, combined with the stiffness of the rubber, keeps them from turning down easily or flopping. The roller is several feet long and placed at an angle. It is revolved in a direction opposite to the movement of the machine, and cleans the asphalt in a thorough manner, even picking up such small trifles as pins.

RIVER PADDLE-WHEEL STEAMER ON OCEAN VOYAGE

This illustration shows the new paddle steamer "Naraguta" starting on her long ocean voyage from England to the west coast of Africa, where she is to be used in shallow river navigation. It is obvious from her extraordinary appearance that temporary erections were made to prepare her for open-ocean sailing. The sides, one of which is shown

River Boat at Sea

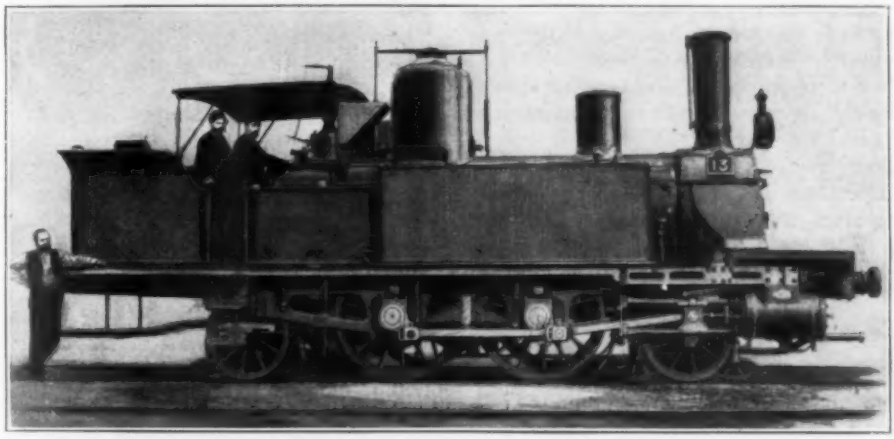
tightly boarded in the illustration, will be as open as a Mississippi steamboat after the coast is reached. The vessel is 200 ft. long, but only draws 4 ft. 6 in. of water.

REMARKABLE ARRANGEMENT OF LOCOMOTIVE WHEELS

This French engine was used on a railroad noted for its extraordinarily sharp curves. The drive wheels were flangeless and to keep the engines from leaving the track it was necessary to resort to the arrangement of guiding wheels shown in the illustration.

Courtesy Signs of the Times

Illuminated Butter Sign



The Drivers are Flangeless—Note the Guide Wheels

THE SIZE AND COST OF ELECTRIC SIGNS

Electric signs are one of the most important factors in outdoor advertising, but whether or not the larger the sign the greater the advertising value is a question now being seriously considered by advertisers and signmakers.

Undoubtedly the larger the display, as long as it is to be only one display anyway, the greater its value, but the same amount of money placed in a number of smaller displays is believed to be more valuable. The largest sign in the world is a roof sign in Jersey City. The letters are 20 ft. high, the framework is 200 ft. long by 50 ft. in height, and the incandescent lamps used number 3,000. The cost of the sign was about $12,000, to say nothing of its maintenance. The question is whether such a sign, situated in a most conspicuous place for outdoor advertising, is a better medium than twelve $1,000-signs distributed throughout the city. Many think not.

In the world of advertising there are block letter and flush letter signs, either vertical or horizontal; talking signs, panel signs, roof signs and signs that are illuminated from the inside.

RAILROAD TIES FROM HAWAII

A sawmill, which will undoubtedly be one of the largest in the world for cutting railroad ties, is being constructed on the island of Hawaii by a company which has a contract to furnish 1,000,000 ties a year to an American railroad. It is expected that the

mill, which is located near the Kilauea volcano, will turn out 100,000 ft. of ties per day. Four ties will be sawed at a time, while additional saws will take the surplus timber and convert it into lumber.

A New York state farmer has requested an insurance policy which will protect his property from damage by airships as well as by lightning.

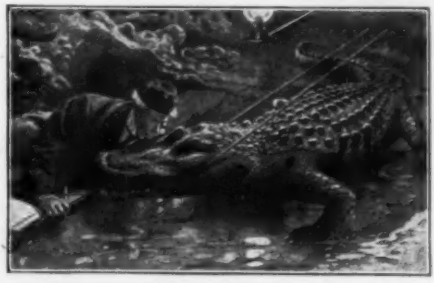
UNUSUAL CONSTRUCTION IN A BRICK WALL

In removing an old brick wall to make room for a new brick building in Los Angeles, great difficulty was found in tearing out the old bricks, as they were laid in an unusually strong cement mortar. It was at last accomplished by cutting the old wall out in large blocks, some of which weighed more than 1½ tons, but as the bricks were wanted to form part of the new wall, it was also found necessary to put them back again in the same form. The curiously patched appearance of the new wall constructed in such an unusual manner is shown by the illustration.

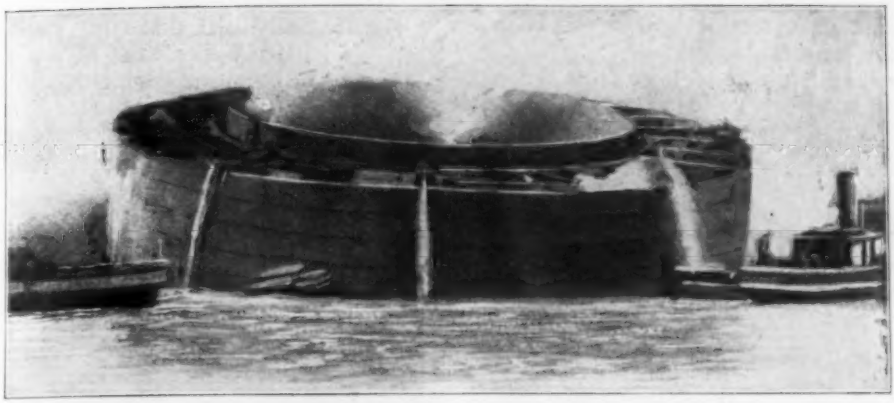
Solid Pieces of Old Wall Incorporated in New

STUDYING THE EYE OF A LIVE ALLIGATOR

An English student of animal life who has made a wonderful series of drawings of the eyes of animals, is shown in this illustration examining one of the eyes of a Mississippi alli-



A Critical Moment



This mammoth piece of iron-work, designed for the intake of the new waterworks tunnel in the Niagara river, at the foot of Porter avenue, Buffalo, keeled over just as it was started on its trip down the stream and sunk to the bottom of the basin. The illustration shows the work of raising the huge intake in progress. A general description of the intake was given in a previous issue.

gator in the London Zoological Gardens. The officials drained the tank of water and the alligator was held by a rope passed between the jaws in order to prevent him snapping at the investigator when he was using his ophthalmoscope.

THE GLOBE IN FLOWERS

This flower design of the globe, located in one of the St. Louis parks, is drawing considerable attention because of its remarkable ingenuity and uniqueness. The globe itself contains 32,000 plants, and the flower bed upon which it stands is 60 ft. in diameter and contains 16,000 plants. The continents are made of alternantheras in four colors. The oceans and the Sahara desert are made of Santoline incana and sedums.

The globe was made of wood and then covered with a wire netting and sea weed. It took a carload of soil to fill it. The globe revolves, but not automatically, the employees taking the place of nature's force in this instance in order to give the plants on all sides their share of the sun.

FLAG TO INDICATE SUBMARINES

The secretary of the navy has sent to the customs officers of the various Atlantic and Pacific ocean ports a notification that hereafter all ship captains entering and leaving harbors must keep a sharp lookout for a craft flying a flag with a black fish on a white background, surrounded by a red border. This flag, which is designed for the submarine branch of the U. S. navy, will indicate

Floral Map of the World

that a submarine boat is working in the vicinity.

The flag will be flown from the mast of a tender, or what is known as a "parent" ship. Such a vessel always attends a submarine during experiments. The flag will warn sailing vessels and steamships that if they do not give the locality a wide berth there is a possibility of the submarine coming up underneath and doing all kinds of damage.

HAT-MAKING IN THE EAST INDIES

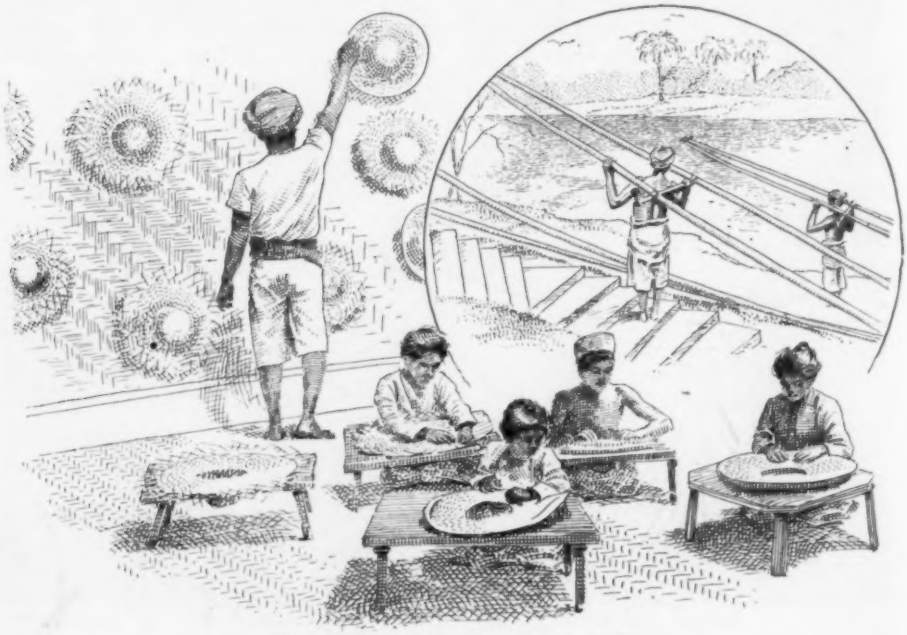
The making of bamboo hats is one of the chief industries of the natives of the East Indies, and quite often the children are more expert than their mothers in weaving the strips together and forming the designs, their fingers being younger and more supple. In transporting the long stalks of bamboo to the factory, the natives tie the ends of two stalks together, spread them apart a short distance forward of the center, tie a cross-piece between, and carry them on their shoulders.

HUGE SUNFISH CAUGHT ON LIGHT TACKLE

This monster sunfish, measuring 11 ft. across, 9 ft. in length, and estimated to weigh fully 1,000 lb., was captured

1000-Lb. Sunfish

by Prof. C. F. Holder, of Pasadena, Cal., while fishing at Santa Catalina during the month of August. Although not the largest sunfish ever captured, the catch was remarkable, as his fishing outfit consisted of a 9-oz. rod and a 9-strand line. The struggle lasted almost four hours, and before the incident was closed Prof. Holder, Col. C.



The Making of Bamboo Hats in India

P. Morehouse, of Pasadena, and the boatman were drenched with spray and almost exhausted. Two launches were required to tow the fish a distance of six miles. As Prof. Holder is an advocate of true sportsmanship, the fish was released after being photographed.

PROTECTING NEWLY LAID CEMENT SIDEWALKS

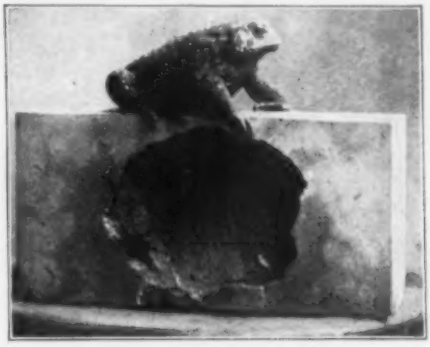
The problem of keeping people and animals off of a newly laid cement sidewalk, usually a difficult task, is sometimes solved in the manner here shown. A few hours after this sidewalk was finished, soft dirt was thrown over it and a little ridge built along each side. The dirt was then well saturated with water. Such treatment was found to be effectual in keeping intruders off, and also furnished moisture for advantageous setting of the cement. Very often in walking along a cement sidewalk footprints of man and beast are found.

Protecting a New Walk

TOAD WITHSTANDS GREAT PRESSURE

An experiment, bordering close to the wonderful, was recently made in the clay testing department of a machinery company at Bucyrus, Ohio, in which a toad was placed in a 20-ton brick press and was four times subjected to a pressure of 11,000 lb. without injury.

The question at issue was whether such a pressure would kill the toad or whether its ability to compress itself was sufficient to allow it to come out of the ordeal alive. The toad was first placed in a lump of granulous clay and the whole pressed into a brick. After the huge press had done its work the solid brick was lifted from the machine and the toad winked its eyes contentedly, stretched its legs and hopped away.

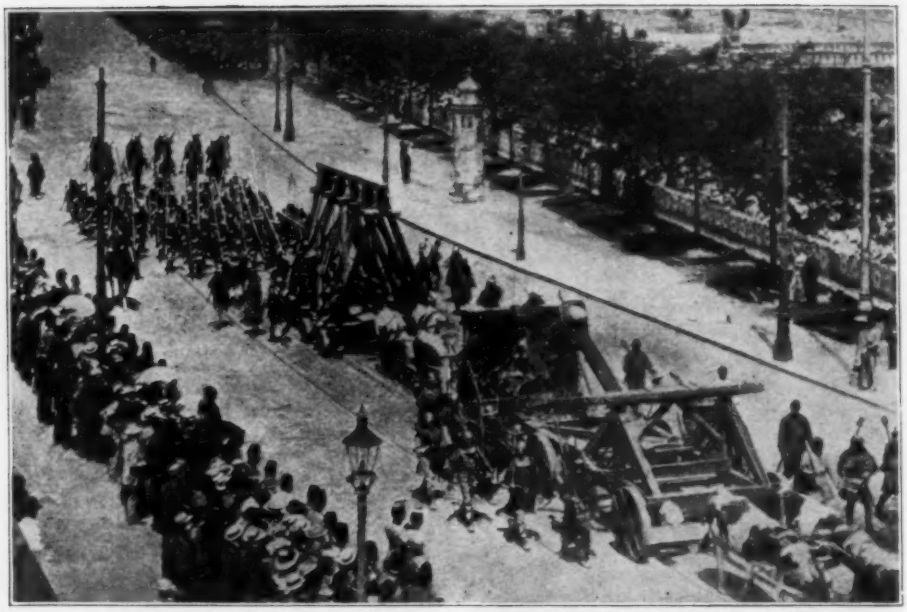


The Toad and His Prison

THE SPLASH OF A LIFEBOAT LAUNCHING

It is almost impossible to overestimate the difficulties of launching a lifeboat when a heavy sea is raging, yet the staunch little boats, although they may be thrown back on the beach once or twice, ultimately get through the surf. This photograph was taken of a lifeboat entering the surf during a recent storm off the coast of England. It would seem impossible that even a lifeboat could get through the tons of displaced water and the clouds of spray.

Safely Launched



Artillery of the Year 1000 Reproduced in Parade

ARTILLERY OF MIDDLE AGES RESURRECTED IN PARADE

One of the most interesting events of the jubilee fête of Francis Joseph, Emperor of the Austrians, recently celebrated in Vienna, was the parade in which a complete set of ancient artillery, most faithfully reproduced, and accompanied by soldiers dressed in the garb and carrying the arms of the mighty warriors of the year 1000, was shown. The battering rams and catapults were drawn by slow teams of oxen.

A MECHANICAL "CAKE WALK" AMUSEMENT DEVICE

One of the most amusing of all the amusement devices at Earl's Court exhibition in London, not only to participants but to spectators alike, is a series of moving runways which compels the participant to do the cake walk with an eccentricity of movement unknown to the originators of the dance. Those who tempt fate find themselves holding fast to a couple of rails and seeking to advance along a platform that is remarkable for everything but stability.

It is interesting to note that the cake walk, long forgotten in America, is still fresh in the minds of the Londoner and the Parisian.

The Mechanical Cake-Walk

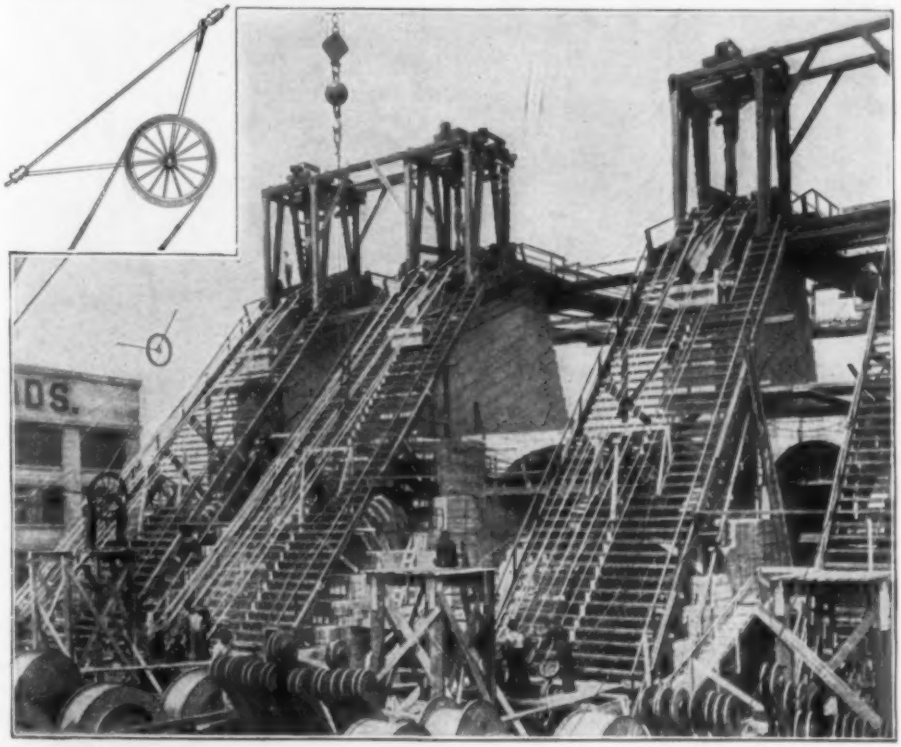
CABLE HAULING ON THE NEW MANHATTAN BRIDGE

The four huge cables that will support the new Manhattan bridge, connecting Brooklyn and Manhattan, are being hauled into place and strung by a novel method. Each cable will contain 37 strands of 256 wires each, a total of 9,472 wires in each cable, which must be strung wire by wire, involving an enormous amount of work.

The stringing of the wires in each cable is accomplished by means of two traveling sheaves carried on opposite legs of an endless steel rope. Each sheave consists of a 3-ft. grooved wheel fastened to the hauling rope by means of wrought-iron brackets. The hauling rope is $\frac{3}{4}$ in. in diameter and runs above the position of the bridge cables on heavy rollers supported on uprights on the temporary foot bridge. There are five of these hauling rope supports on the center span, two on each of the end spans, and one on each of the towers.

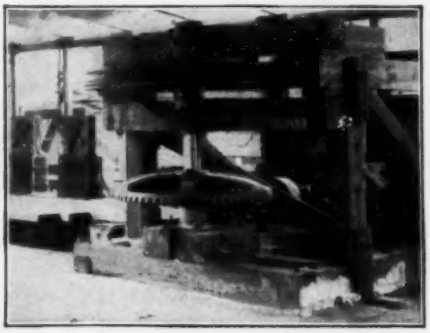
Showing Completed Cables

The wire is delivered to the bridge on enormous reels, weighing 3 tons each. Half of these reels are placed at each end. The end of a wire from a reel is put over a hauling sheave and fastened to the anchorage. The ma-



View of Brooklyn Anchorage, Showing One Hauling Sheave Starting Across

chinery is then started and the sheave moves across the bridge, a distance of 3,223 ft., unwinding the wire. When the sheave reaches the opposite side of the bridge the bight of wire is taken off and made fast to that anchorage, and a new wire hauled back on the



Machine Drawing Wires

return trip. The wires are laid in temporary saddles of four grooved pulleys at each anchorage. As the hauling of each strand of 256 wires is completed the wires are bound together and the strand lifted from the temporary saddle and laid in its proper place in the permanent saddle.

The hauling ropes, each of which is driven by a 50-hp. electric motor, move at a speed of approximately 480 ft. per minute, carrying the sheaves across the river in about seven or eight minutes. Allowing for the time used in attaching wires at each end, about three trips are made per hour. It is estimated that at this rate the work of hauling will take four months, some time being consumed in fixing guide wires for each strand.

VESSELS TO BE GUIDED BY ECHOES OF THEIR OWN WHISTLES

The United States government is experimenting in San Francisco Bay with a safety device for foggy weather which is remarkable in the uniqueness of its idea. It is nothing less than a fog buoy which will make no noise of its own but which will be expected to catch the sound waves of a vessel's whistle and echo them back across the water.

The buoy, or structure, is constructed of corrugated iron sheeting, placed on piles, and built in three wings placed at different angles. Each wing is 32 ft. square.

The idea was given birth accidentally. There has always been much trouble in the upper part of San Francisco Bay because the shore lights cannot be seen when the weather is bad. Pilots and skippers began to notice, however, how clearly the corrugated steel warehouses around Benicia returned the sound of their whistles, and for some time have been guiding their way along by the echoes. The government is confident that the new buoys will act in the same manner.

OLDEST TICKET OFFICE IN THE UNITED STATES

The oldest ticket office in the United States now in existence is in Delaware. It was erected in 1832, at which time the New Castle and Frenchtown railroad, one of the first in the country, was built for transporting freight and passengers from boats on the Delaware river at New Castle to boats on the

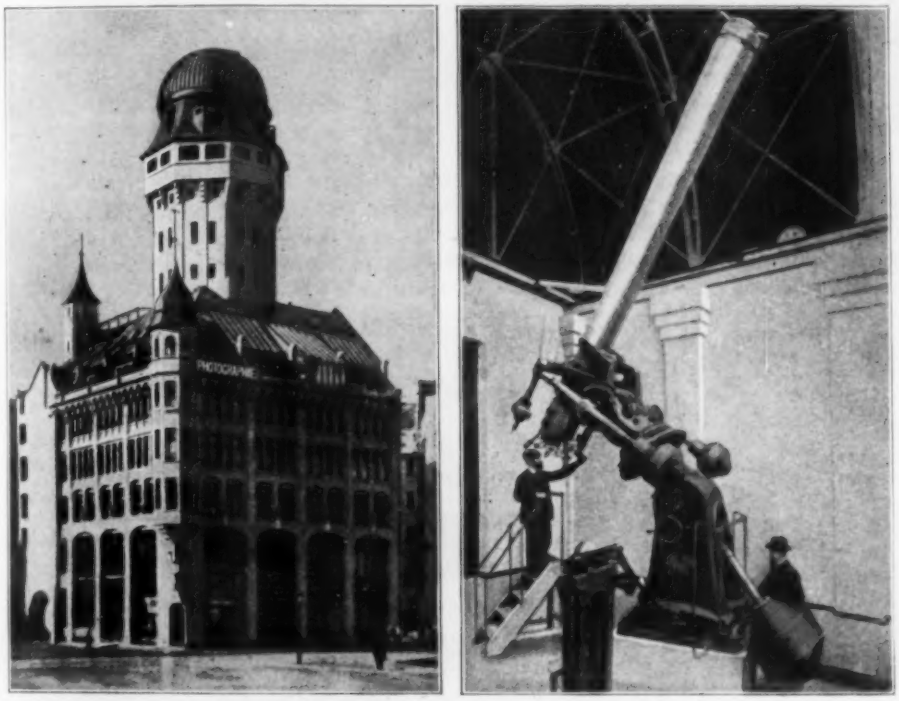
The Oldest Ticket Office

Chesapeake river at Frenchtown. The office is now in the possession of the Pennsylvania railroad.

AN OBSERVATORY FOR THE PUBLIC

The only genuinely public observatory in the world is at Zurich, Switzerland. It is open every evening to the public, and during the past six months was visited by no fewer than 25,000 people. The telescope, which is mounted in an entirely new and ingenious way, as shown in the second illustration, is 17 ft. 6 in. long and weighs 14 tons. Its object glass is 12 in. in diameter. Attached to the instrument is a projecting screen, upon which objects in the heavens are thrown for the benefit of those waiting to get a peep through the telescope itself.

The existence of such an observatory in Switzerland is an object lesson which should be absorbed by larger nations and profited by. Surely, such an observatory in cities like Chicago and New York would be a great source of pleasure and education for the public. It would not be a bad idea, now that America has so many libraries, for some multi-millionaire to come forward with the required funds for a really public observatory.



This Observatory Is for the Free Use of the People

OLD PAINTINGS RENEWED BY ELECTRIC MACHINE

A Munich artist and inventor has devised an electric machine by which the famous paintings of the "old masters" can be renewed, without additional paint or damage of any kind to the original work. Such an invention, if it is as simple and practical as is claimed, will make possible the renewal of old paintings at a cost which is not prohibitive.

There are a number of artists in different parts of the world who have become famous for their wonderful work in renewing and repairing pictures

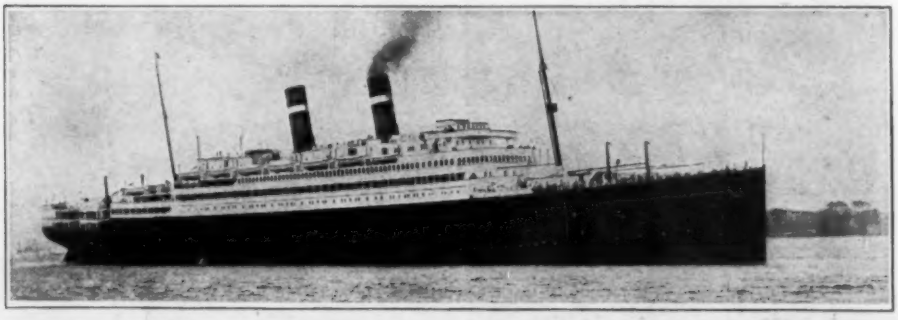
which have become almost obliterated by age and neglect, but they charge, and perhaps justly so, a tremendous price for their services. Many paintings by old masters have become almost completely ruined by over-painting, and it is claimed that the machine will take off the over-paint and restore the real picture without damage.

LARGEST SHIP UNDER DUTCH FLAG

The new trans-Atlantic liner "Rotterdam," which sails between New York and Rotterdam, is the largest ship under the Dutch flag and one of the finest ever built. She is nearly 25,000 tons gross register, with a displacement of over 35,000 tons. Her length is 668 ft.; beam, 77 ft.; depth, 57 ft. Two sets of quadruple-expansion engines arranged on the balance principle, developing about 14,000 hp., give her a speed of 19 miles an hour, thus enabling her to make the trip from Rotterdam to New York in eight days.

She has nine steel decks, connected by electric passenger and package elevators. A refrigeration system has been installed for both provisions and cargo. The first-class saloon, shown in one of the illustrations, provides seating accommodation for 500 passengers, and the second-class for 300. In connection with the social hall is a palm court, a new feature in naval architecture.

The interior decorations of the public rooms, entrances and state rooms are magnificent. In the first-class saloon the walls are of paneled work, painted gray, decorated with different reliefs in white and old gold, relieved by double sets of stained-glass windows, framed in brass. The tables, which are of mahogany, are arranged on the popular restaurant order. The social hall is dark mahogany paneling work, inlaid with silver gray, rose and palm wood. The library and writing room is in Italian walnut paneling, inlaid with silver gray walnut and palm wood. A separate room is provided with typewriters.



Courtesy Shipping World

She Has Nine Decks Connected by Electric Elevators

OX TEAM CROSSES CONTINENT TWICE

Ezra Meeker and His Overland Outfit

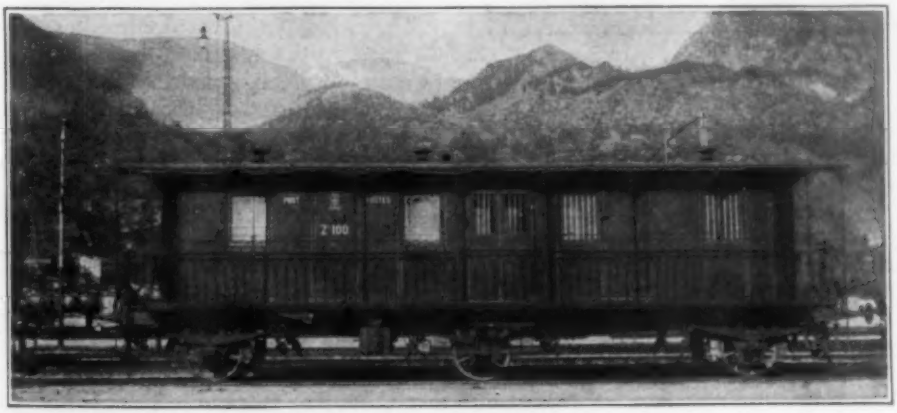
This is a photograph of the ox team which crossed the American continent twice, covering in all a distance of 7,300 miles. The time for the round trip, including all stops, was 2 years, 6 months and 22 days. The trip was made from Seattle, Wash., to the White House, Washington, D. C.

In the center of the picture is Ezra Meeker, the owner of the team. His first trip across the continent was made in 1852. He is now 78 years of age, but enjoyed the round trip recently completed much better than his early experience. The iron work on the wagon shown in the photograph was part of the wagon which figured in his trip made in the fifties.

The most important government stations in Alaska are now in wireless communication with the United States.

SWISS POSTAL CAR

The Swiss postal cars have an outside platform or porch running completely around them, closed in by an iron fence or railing. They are painted dark red to make them easily distinguishable from the passenger cars, which are dark green.



This Mail Car Has an Outside Gallery

THE SLEEPING SICKNESS OF TROPICAL AFRICA

Sleeping sickness, the most feared disease in tropical Africa, is spread by the tsetse-fly. So great have the ravages of the disease become that the English government has established a National Sleeping Sickness Bureau in London to act in co-operation with the Sudanese government and the Royal Society. Its work will be the collection of topographical, statistical, pathological, and other information regarding sleeping sickness, and to arrange for its prompt distribution among those who are engaged in combating the disease, as well as for the circulation of publications designed for the use and guidance of government officials and missionaries in all infested parts of Africa.

The Deadly Fly and Victims

The usual course of the disease is from four to eight months. At the outset there is headache, a feverish condition, lassitude, and corresponding disinclination to work. The facial aspect changes and a previously happy and intelligent looking negro becomes, instead, dull, heavy, and apathetic. Later, tremor in the tongue develops, speech is uncertain and mumbling, walk shuffling, and progressive weakness, drowsiness, and oblivion to his surroundings afflict the sufferer. The last stage is marked by extreme emaciation, and a coma deepening into death.

Since its introduction into the English Protectorate of Uganda in 1901, the disease has levied a heavy toll on the unfortunate natives, no fewer than 200,000 out of a total population of 300,000 in the afflicted districts having been swept away. In large areas of the Congo Free State it has decimated the tribes. It has also appeared in the Sudan, and is now threatening German East Africa, Rhodesia, and the British Central Africa Protectorate. Coupled with the native mortality are cases of Europeans who have succumbed to the disease, a few of whom have died in England while under medical treatment.

The tsetse-fly is a blood-sucking, day-flying insect. On the approach of either man or animal at a river crossing in the densest forest, the victim is soon scented out by the fly, if there is one in the vicinity, and then, either silently, or with a peevish buzz, it makes straight for the most accessible spot and makes its stab.

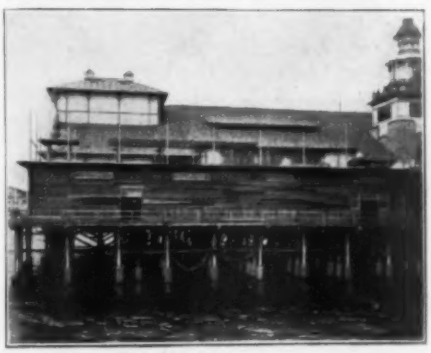
The cause of the rapid spread of the disease remained a mystery until the Uganda outbreak, and in 1902 the veil was in part lifted by the finding of a particular microscopic parasite in cerebro-spinal fluid taken from sickness patients. From this point additional workers irrefutably discovered that the parasite was present in all cases of the disease and associated with its course. Soon after it was demonstrated that a correlation existed between the prevalence of the disease in the stricken areas and the presence of the tsetse-fly, and that these flies transmitted the parasite from the sick to the healthy.

FIGHTING THE TEREDO WITH CONCRETE

The ravages of the teredo along the Pacific coast are being effectively combated by the use of concrete instead of wood for piles, or as a coating for wooden piles not yet eaten beyond repair. The first illustration shows a pier built at Ocean Park, Cal., about seven years ago. Some of the 14-in. piles are completely eaten through and will have to be replaced with concrete.

The second illustration shows the concrete pier being built at Santa Monica, and the third will give an idea of the type of concrete piles being used. They are 36 ft. long and 14 in. in diameter. An additional 4-in. coat of concrete is cast around the piles up to the height of the water line, after they are set. The pier will cost $85,000.

The fourth illustration shows new wooden piles coated with concrete and the fifth the molds by which the work is accomplished. This process is much simpler and cheaper than the all-concrete piles. The scalloped or perforated bottoms of the molds are fastened around the pile as a collar is fastened around a man's neck, and as the scallops or serrations turn upwards and are in a double layer, the wet concrete cannot sift through. Jackets are tied to the tops of the molds with wire and the tops of the jackets are held above the surface of the water by two ropes. As the jackets become filled with the wet concrete they are carefully lowered, the mold sliding down the pile, and jacket after jacket is added until the ocean bottom is reached. A jet is then used to settle the bottom about 5 ft. into the sand. The molds, being inexpensive, are left and rust out in time. Wire netting is inserted in the concrete as a reinforcement while casting. This process is being used to a great extent at Venice, Cal.



A paper nursing bottle for babies is one of the latest patents. After it is used once it is thrown away.

A GENUINE GIRL MINER

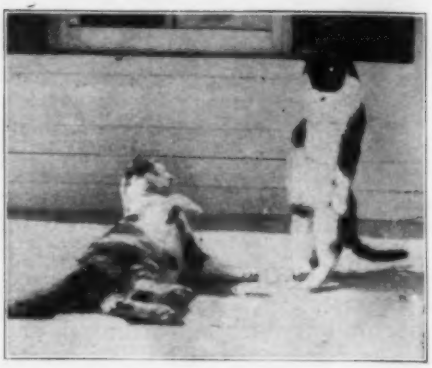
Nevada has a girl miner—not a mere prospector but a regular "working" miner—and she toils eight hours a day for every working day in the week. Her name is Laura White, her age is 22 years, and she hails from San Francisco. Some time ago she located several mining claims in the dreary Funeral Range, near the eastern edge of the famous Death Valley. One of the claims proved to be a rich one and she and her brother are working it alone.

"Her Name is Laura White"

The brother works at the bottom of the shaft and Miss White hoists the ore to the top. At first she wore skirts, but finding that they impeded her work, she donned the miners' regulation boots, trousers, shirt and Mexican sombrero.

CAMERA CATCHES CATS IN UNUSUAL POSE

It is only seldom that it is possible for a camera man to get a photograph of cats in such an unusual pose, but in this instance the camera and the man were in the right place at the right moment, with the gratifying result here shown. The cat reared up on its hind



An Unusual Photograph

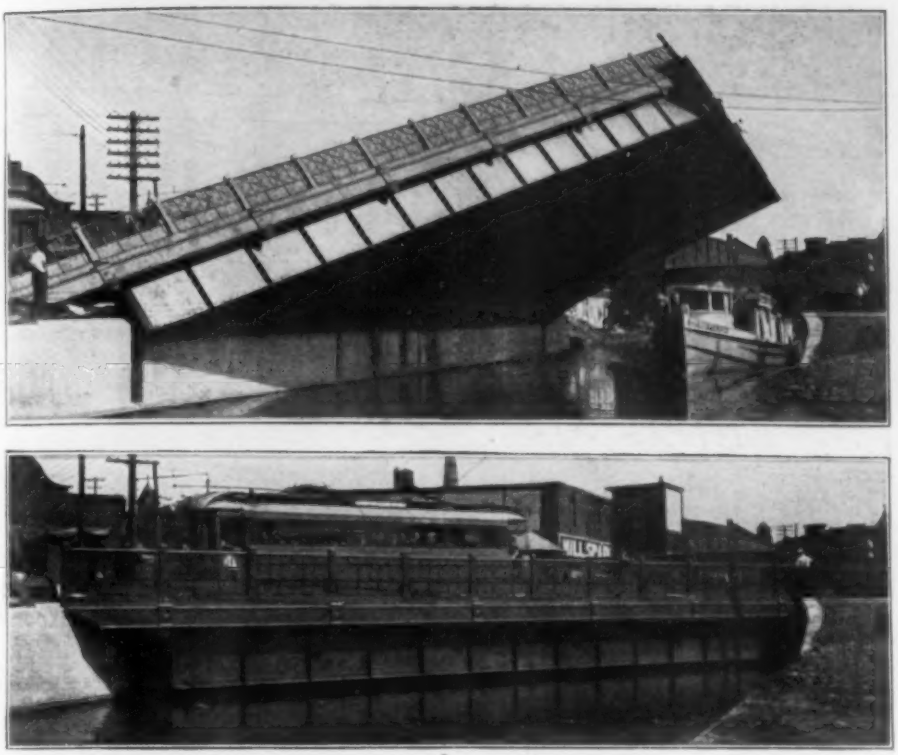
legs to escape the friendly attack of the reclining cat has unconsciously struck a pose that could not possibly be improved upon by a comic opera king or knight errant.

BASCULE BRIDGE OF OBLIQUE CONSTRUCTION

The new bascule bridge over the Oswego canal at Syracuse, N. Y., has several unique features. The most interesting of these is its shape. Owing to the fact that the street crosses the canal at an angle of about 52 degrees it was necessary to construct the bridge on a skew, or obliquely. It is also claimed to be the only bascule bridge in the world which is paved, and the only one having its entire operating mechanism, including the counterweight, below the street level.

The construction of the bridge required the excavation of 9,000 cu. yd. of earth and rock. More than 2,000 cu. yd. of concrete were used in the foundation and 225 cu. yd. in the counterweight. The counterweight is in the form of a reinforced concrete girder 50 ft. long, supported between two main lifting girders.

The bridge is operated by water from the city mains at a pressure of 95 lb. per square inch. The operating mechanism, which consists of a cylinder of 36-in. bore, in which moves a piston having a stroke of 17 ft. 4 in., is mounted upon the counterweight. The bridge operates on the plan of a "see-saw."



Oblique Bascule Bridge at Syracuse, N. Y.

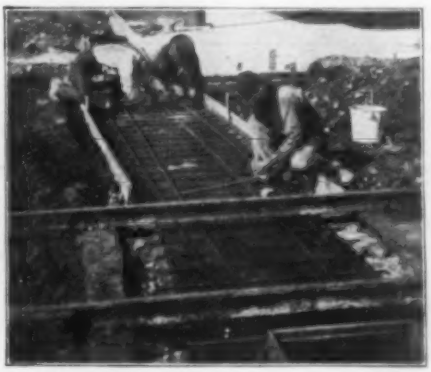
Attached to the piston rod is a rack which engages a pinion mounted upon a shaft 50 ft. long. Two more pinions, one at each end of the 50-ft. shaft, engage curved racks, 24 ft. 9 in. long, mounted in the concrete on the side of the pit. When the water enters the cylinder, setting the machinery in motion, the counterweight goes to the bottom of the pit, and the bridge goes up.

The bridge swings upon two pins, each 14 in. in diameter, supported in boxes. The entire weight of the bridge, including counterweight and operating mechanism, is 750 tons. The surface of the bridge is in the form of a rhomboid. The longer side, which is parallel with the canal, measures 107 ft., and the shorter side, parallel with the street, 75 ft. The roadway is 40 ft. wide, paved with wood blocks.

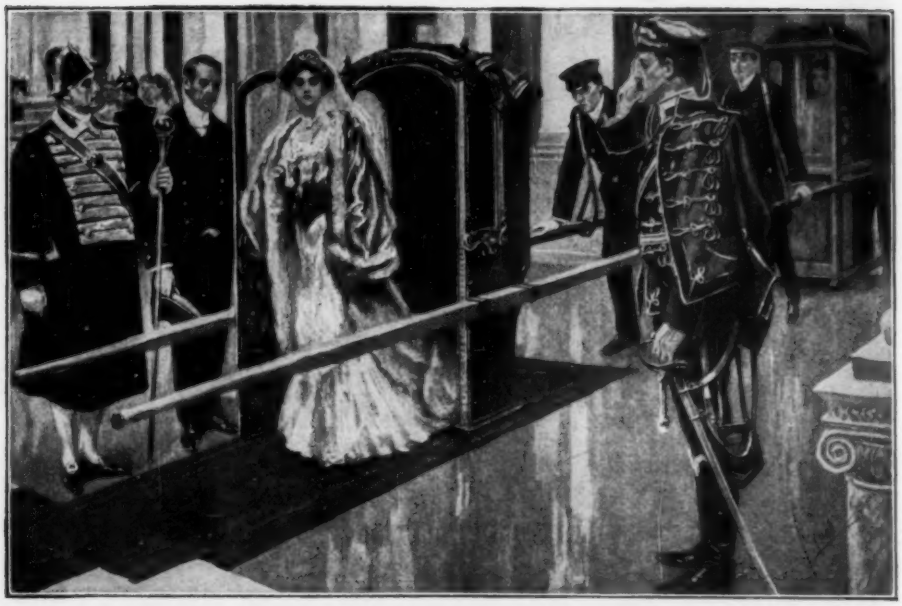
A Jap was caught sketching the forts at Boston recently.

CONCRETE CULVERTS UNDER TRACKS

In building reinforced concrete culverts under railway tracks, the walls are first made and a false ceiling, covered with building paper, placed in position. Twisted steel rods are then placed as shown in the illustration and



Laying the Rods



The sedan chair, which was at its height of usefulness in the seventeenth and eighteenth centuries, is still used in Dresden, and is a pretty survival of an old-world custom. Noble ladies are still carried to the court balls and to the opera by the ancient corporation of Court Chair-Carriers.

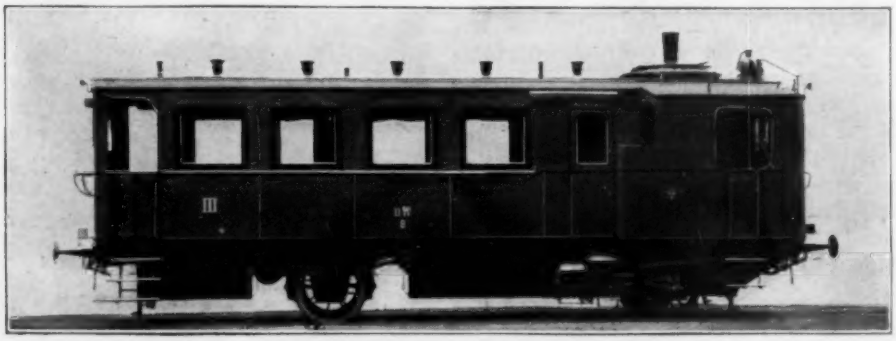
tied together. The whole web is then raised about 1¼ in. by placing a little concrete under it, and the concrete tamped in place on its top.

A GERMAN MOTOR CAR

This self-propelled car is one of the type now being installed on some of the German interurban lines. The machinery which propels the drive wheels is shown at the side and a little to the rear of the forward truck. Unlike cars of the same class in this country the trucks are single-wheeled.

CARE OF FERNS FOR THE WINTER

When ferns are to give their best beauty for the winter they should be repotted in August. Shake off the old soil as much as possible, clean out the dead roots or fronds and pot up in a pot a trifle larger than necessary to receive the roots comfortably. Place small pieces of charcoal to a depth of ¾ to 1 in. in the bottom of the pot for drainage, make a mixture of equal parts rotted manure, clay and leaf mold



German Motor Car—Single Bogie Trucks

and pack firmly around the roots until it fills the pot up to about half way on the shoulder or collar of the pot. Set the pot in a pan of water and allow the soil to become thoroughly saturated to the surface by absorption. This will fix the soil firmly to the roots. Do not water until almost dry, after which water moderately, never allowing the soil to become either soggy or dust dry. A feeding every ten days or two weeks with liquid manure or some good flower food with occasional stirring or loosening of the soil is necessary. Never allow sediment to settle in the saucer in which the pots stand, as it will ruin them in a short time. Never repot a plant in a pot more than one size larger than the one in which the plant was bought, as plants will not give their best beauty when overpotted. A person looks dressy when the wearing apparel is a fit; so with a plant, too large a pot is a misfit and the plant is uncomfortable.—Contributed by Budd Park Greenhouses, Kansas City, Mo.

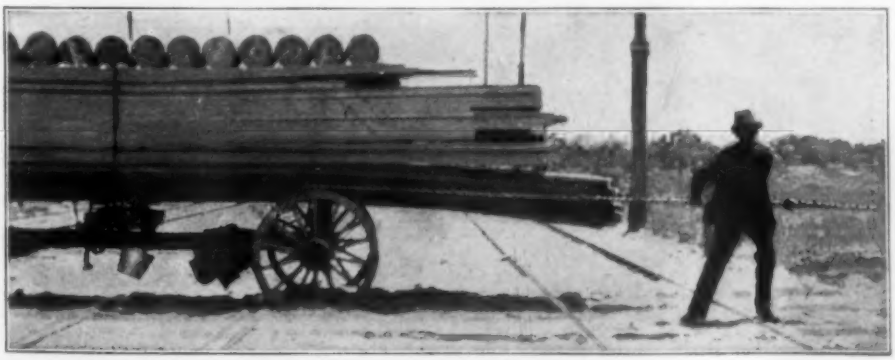
STALLED ON A SANDY CROSSING

This heavy load of lumber and nails became stalled on the sandy crossing of an electric railway line. Four horses could not pull it out, as both hind wheels were set squarely against one of the rails. By fastening a chain to the rim of one of the rear wheels two horses easily pulled it back about 3 ft. With the start of 36 in. the horses were able to haul the load over the rails.

From Illustrated London News

AUSTRALIAN JAVELIN EXPERTS

The most important weapon of the aboriginal Australian is the long spear which he throws by the aid of a "womerah" or throwing stick. The spears are from 7 to 10 ft. long and the throwing stick measures about 3 ft. As cattle-stealers the natives give the Australian police much trouble. When they have speared a beast they cut off only enough meat for immediate use, leaving the carcass to rot. Next day, should they want more meat, they do not scruple to kill another animal.



A Case Where Brains Won When Muscle Failed

ARMY LEARNS FROM INDIANS

Military Fireworks for Day and Night Signals on Land and Sea

Pistol That Shoots Colored Stars — Section of Signal Bomb

Putting Colored Fire Cartridge Together to Form Message

Setting Off a Smoke Rocket — Operating a Smoke Bomb

Just as the fighting men of the United States army, many years ago, took lessons from the Indians and from their methods of warfare devised and perfected the system of extended order or skirmish drills which have proven so effective, so the Signal Corps of the army has followed to a large extent the Red Men's methods of conveying information from point to point where there is not time to string telegraph or telephone lines or where wireless telegraphy is unavailable.

As the Indians, since prehistoric times, have used columns of smoke in various combinations to signal the approach of an enemy or to transmit other messages, so the army signalmen have found most effective what are known as smoke bombs or smoke rockets. The former are fired from a small mortar, the

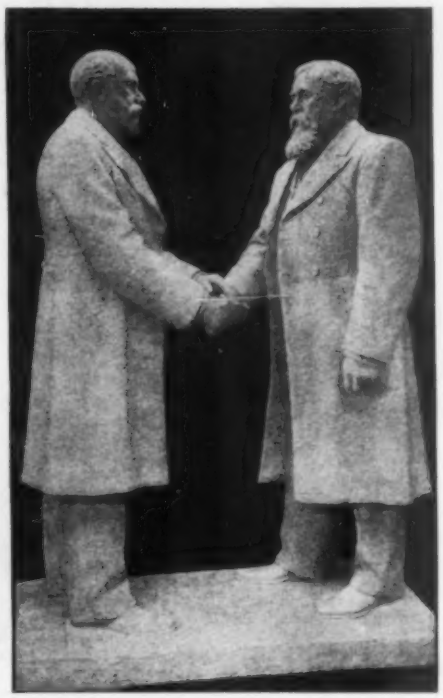
latter in the same way as Fourth of July fireworks. Each when reaching a desired height, regulated by a fuse, bursts and liberates a picric acid compound which ignites from the explosion, burning with a cloud of yellowish smoke which may be seen for miles. By changing the chemical elements of the compound various different colors of smoke can be produced, each to denote its own signal or message.

Another rocket used by the Signal Corps, designed for night work, on bursting sets free a parachute from which is suspended a cartridge, which ignites and burns colored fires, one after the other, so arranged in the cartridge as to convey a message to those who may be watching for it. These cartridges are made in sections, each containing its own different colored fire, and threaded to screw together in a fraction of a minute.

These military fireworks, as they might aptly be called, are packed in hermetically sealed cans, much in the same manner as tinned meats, with the same sort of thumbscrew attachment for opening them quickly. In this way they keep indefinitely in any climate and have been found particularly effective in the campaigns in the Philippines.

While the navy does not employ so complicated a system of rocket and bomb signaling as does the army, every warship carries a supply of powerful rockets which liberate on bursting a series of brilliant white stars for the purpose of calling attention to other signals which are transmitted by a system of combinations of colored electric lights, strung from a masthead and operated from a switchboard much on the plan of a typewriter, called the Ardois system. But both branches of the service employ an odd sort of pistol, the invention of a naval officer, which shoots from cartridges "stars" similar to those of a Roman candle, of any color. The combinations which can be made in this manner practically are numberless.

A KING AND A PRESIDENT IN BUTTER



This remarkable statue of the meeting of King Edward and President Fallieres was carved in butter by a well-known sculptor, and took four weeks to complete. During that period the butter was kept at the freezing point. It was one of the exhibits in the Canadian Pavilion at the Franco-English Exposition. The service of a powerful refrigeration plant was required to keep it intact.

ASHES FOR PILLARS IN COAL MINES

Ashes are being used to prevent cave-ins in some of the anthracite coal mines of northeastern Pennsylvania, and to enable the miners to take out the coal left as supports.

The work is done by flushing the ashes into the spaces formerly occupied

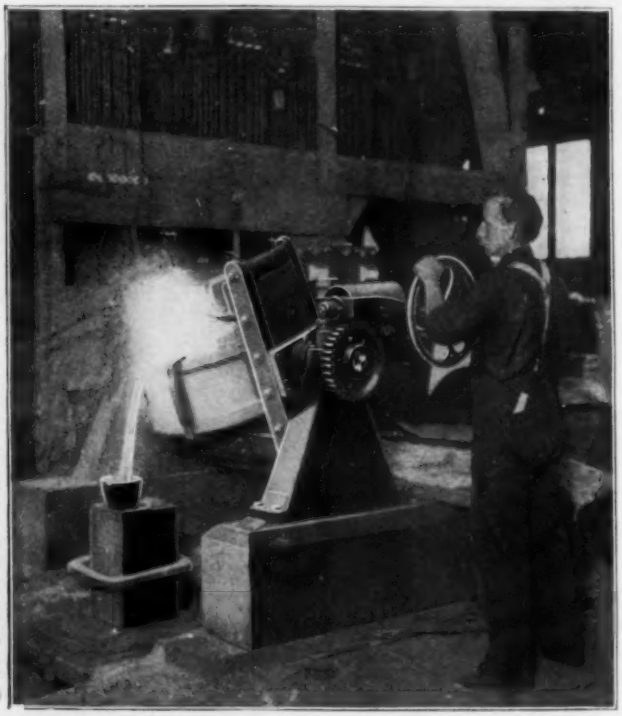
by coal and then allowing the water to drain off. This leaves the ashes in a solid mass, capable of holding up the earth and rock above. The boiler plant of one of the mines where this is being done consumes 300 tons of coal daily, and it is estimated that about 50 tons of ashes a day are sent down into the mine. The water used for flushing runs through a tunnel that passes beneath the ash pits, and at intervals the ashes are shaken into it from above. The flow of water carries the ashes straight down through the ground to the mine, where it is forced into pipes running to the worked-out places to be filled. When the ash-pillars become large and firm enough to be safe supports the coal pillars are taken out. The coal pillars contain hundreds of tons of coal.

ELECTRIC SMELTING OF IRON

Experiments in California with electric induction furnaces prove that only one-third as much coke is required as with a blast furnace, and that electric current can be furnished by water-power at about $5 per ton of metal produced. Assuming the ore, taken from the vast reserves between the Rocky mountains and the Pacific coast, to cost $1.75 and coke $10 per ton, the total cost of producing pig iron with the electric furnace, is estimated at about $16, which seems conservative.

If pig iron can be placed in Pacific coast centers at a cost of $18 per ton, as the experiments would suggest, it will give a great impetus to the industrial development of the west. At Pittsburg the best pig iron is now worth from $16 to $17 per ton. In San Francisco the same grade sells at $26 to $28, owing to the high freight rate.

The illustration shows a 60-kw. induction furnace, which is only a toy compared with the size of induction furnaces being built.



Copyrighted by Am. Elec. Furnace Co.

Small Electric Smelter

A VIRUS FOR THE EXTERMINATION OF RATS

As the result of 15 years of special study, Dr. Jean Danysz, the present director of the laboratory of Agricultural Micro-Biology at the Pasteur Institute in Paris, has successfully solved the problem of the extermination of rats and mice by means of a virus.

The virus, it may be explained, is not a poison in the ordinary sense of the word, as it is harmless to human beings, domestic and other animals, birds, game, etc. This is due to the fact that

the preparation contains the germs of a disease to which only rats and other mouse-like rodents are susceptible. When affected with the virus, the rats make for the open water or air, and are frequently found dead at a considerable distance from the place where the bait was laid. On ships this would mean that rats so affected would go overboard.

On the strictly limited and well defined area of a ship or sea wharf, such a means of extermination would prove absolutely successful, as the disease caused by the virus rapidly spreads from one rodent to others.

NEW YORK'S HIGH PRESSURE SYSTEM

Will Soon Be Required in All Large Cities

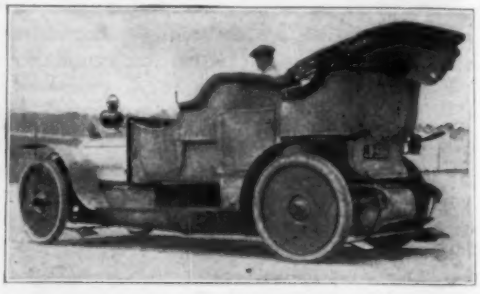
These illustrations give an excellent idea of the force behind New York's great high pressure system for fighting fires. One photograph shows seven huge streams of water being thrown in a test, and the second shows how the volume looks photographed from the top of a nearby building.

AN AUTOMOBILE THAT SWALLOWS ITS OWN DUST

The Royal Automobile club of London recently held a series of exhibitions to try out different methods of minimizing the dust nuisance. One of the automobiles was equipped with the patent exhaust suction device shown in one of the illustrations. The pipes are supposed to suck up the dust from the rear wheels and draw it into a box from which it is again deposited on the road in granulated form. It is a curious idea, but of doubtful utility.

The other illustration shows an automobile equipped with a full length undershield, open at the front and rear, but closed at the sides; and disc wheels, with shoes to each.

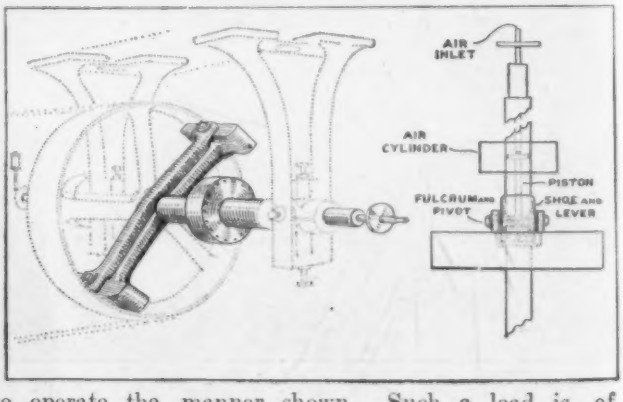
Suction Device



Dust Catcher

A VARIABLE SPEED CLUTCH

The accompanying illustration shows a variable speed clutch operated by compressed air and centrifugal force for use on line shafts and counter shafts of various speed driving. It also can be used in the construction of automobiles. The speed can be changed from the lowest up to the limit of the drive pulley or gear. Air pressure of from 15 to 20 lb. is required to operate the clutch, which may be had in any well-regulated shop. If used on automobiles this pressure can be obtained from the exhaust or an air tank supplied for that purpose. Owing to the ease of starting this clutch, belts will wear longer and give better service.



A TRAIN OF RAILROAD TIES

This illustration shows a train of flat cars loaded with railroad ties. They are piled 15 high and have no support except the end ties, arranged in the manner shown. Such a load is, of course, only possible over a smooth roadbed.

Unsolved Problems in Metal Mining

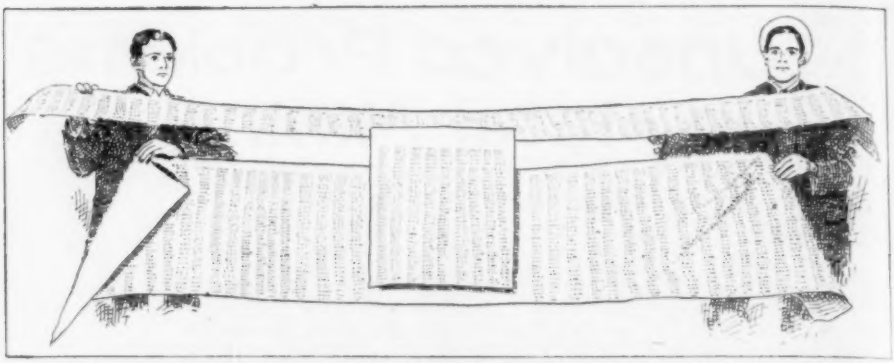
The different branches of the industry which comes under the general head of "mining" are: Prospecting, or searching for mineral deposits; opening up these deposits and exploiting, or working them, the latter including mine working by means of pumping and ventilation, transportation of the mineral to the earth's surface, and the dressing or preparation of the crude mineral, ready for the use of the smelter. All of these branches or departments of the mining industry have their unsolved problems and obstacles to be overcome, furnishing a wide field for inventive genius.

The first of these comes in prospecting. A mineral deposit, generally speaking, can only be discovered when it happens to outcrop at the surface of the earth. The possibility of determining by some means the whereabouts of the hidden treasures has long been an object of the miner's desire, the methods for accomplishing which range from the medieval adept with his divining rod, belief in which is not wholly extinct today, down to a series of modern attempts to use electric currents for the same purpose. Up to the present time these attempts have been unsuccessful, in spite of the ambitious claims of some of their advocates. In view of the fact, however, that minerals differ so widely in their electric and magnetic properties, it is quite possible to conceive that some method of detecting concealed mineral deposits by this means may be devised, but until or unless such a method applicable to all forms of metalliferous deposits be discovered, it will be necessary to fall back upon the slender information that may be derived from geological evidence.

Bore holes are made by means of the well known diamond drill, which brings up a core of the rocks passed through, and thus affords positive information respecting them. Unfortunately, however, the only kind of diamonds suitable for this purpose are very scarce and proportionately dear, so that diamond drilling is a very costly operation. One of the greatest needs at present, therefore, is a metal that shall be strong, tough, and very considerably harder than quartz. The production of such a material would conduce more to the technical advancement of several branches of mining than almost any other discovery that could be named.

Over and above the difficulty of drilling the hole, there is the further one that most bore-holes do not go down straight but are apt to be deflected. The determination of the angle a bore-hole makes with the vertical can now be made with a fair degree of accuracy, but no perfectly satisfactory means of determining the direction of the deviation has yet been devised. The solving of these problems in the prospecting branch of metal mining offers a most promising field, not only to inventors and discoverers, but also to geologists and scientific investigators. The man who succeeds in enabling ore deposits to be discovered of which there is no indication at the surface, is entitled to look for the richest kind of a reward.

Pumping from great depths is another problem that awaits solution, although there are no grounds for supposing that it will present any formidable difficulties. In ordinary deep mines it is now generally performed in stages of moderate height, and there is no difficulty in multiplying such stages to any desired extent. Moreover, single lifts up to 2,000 ft. have already been worked in special



The sample ballots for the recent primaries in Illinois carried dismay to more than one voter's heart before the election commissioners decided which was to be used. One was 6 ft. long, another 7 ft. wide, and still another 3 ft. long by 2 ft. wide.

cases. Much is expected from the modern system of multiple centrifugal pumps coupled direct to electric motors, which have been used to advantage in several cases.

The treatment of the crude minerals after their extraction will undoubtedly take a prominent place among mining problems of the future because upon it depends in great measure the possibility or otherwise of working a number of low-grade deposits. While coarse crushing can be performed today in a tolerably efficient manner, there is plenty of room for improvement in fine crushing machinery. A machine that will crush hard mineral rapidly and uniformly to particles from 1/20-in. to 1/100-in. diameter, capable of working either wet or dry, without producing an undue amount of material much finer than the desired size, without an excessive consumption of power, and without undue wear and tear of the machine itself, is one of the most pressing needs of modern ore-dressing practice, and it cannot be said that any machine hitherto devised comes within even a measurable distance of fulfilling the above conditions. The best evidence of this fact lies in the continued use of the stamp mill for the fine crushing of hard ores. Although improved in most of its details, in dimensions, materials, working capacity, etc., its principle is still that of the old 16th century machines, and in spite of its many admitted imperfections, it still holds its own.

Cheaper Than a Tank

WATERING THE TRADE

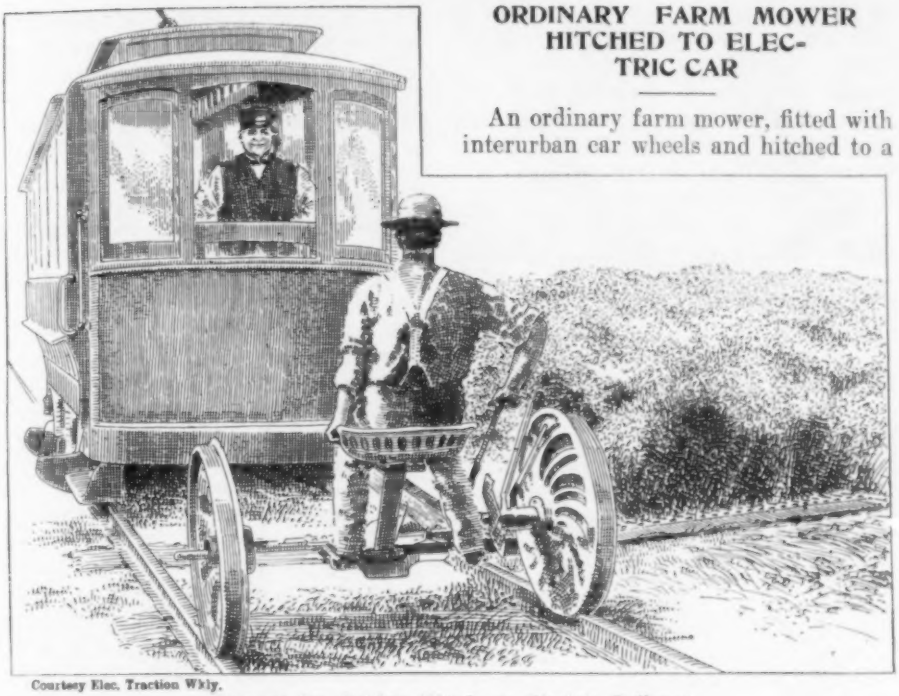
Instead of a watering trough or tank, an accommodation which would be much more expensive, an ingenious hardware dealer in Santa Monica, Cal., has placed a water connection close to the wall at the corner of his store. Anyone can water their horses there and buy a few things at the same time if they so desire.

To "denounce," in the mining code of Mexico, is almost equivalent to announce in English, and means the taking up of a claim.

ORDINARY FARM MOWER HITCHED TO ELECTRIC CAR

An ordinary farm mower, fitted with interurban car wheels and hitched to a motor car, is the ingenious arrangement by which one electric interurban railway company is cutting the weeds along the right-of-way. The cutting machine was an 8-ft. standard mower with an extra long shaft. The only change necessary was the substitution of the interurban car wheels for the mower wheels. These wheels hold the mower on the tracks and are sufficiently heavy to give the necessary traction to run it.

A city street car was used to draw the mower and a swath 8 ft. from the rail was cut at a rate of five miles per hour. Heavy sweet clover, burdock and thistles were cut down easily.



Courtesy Elec. Traction Wkly.

Mower for Cutting Weeds on Electric Railway

A CURIOUS TURKISH POSTAL SERVICE

During a recent epidemic of cholera in one of the Turkish towns near Constantinople, letters were not passed from hand to hand, but were received by the postmen in a tin case at the end of a stick.

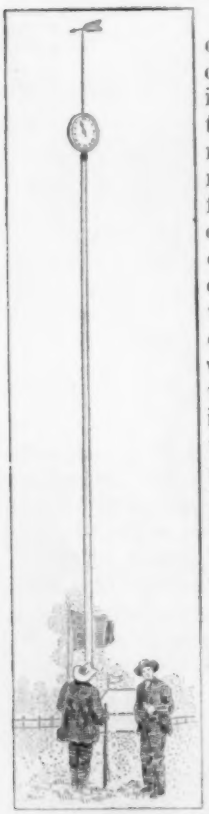
Transferring Mail

A SEA OF CRABS

To sail through a sea of crabs is by no means an everyday occurrence, yet the record of such an experience is written upon the log book of the steamer "Captain Bennett," sailing between Jamaica and Philadelphia. Just south

of Cape Henry the vessel ran into a live sea of hundreds of thousands of crabs, some floating singly, others collected in immense masses. It is believed that the crabs were carried out to sea from Chesapeake Bay by severe storms and found it impossible to get back to their accustomed waters.

NEW DEVICE FOR RIFLE RANGES



The Dial Indicates the Score

One of the experts of an English rifle club has devised an ingenious instrument to aid in accurate rifle shooting. It will replace the small flags at present used on rifle ranges to indicate the direction of the wind. The vane above the clock dial is set so that when pointing towards the target it indicates that the wind is blowing from that direction. The hand and figures on the dial tell how many miles an hour the wind is blowing.

RESTORED TO LIFE BY HEART MASSAGE

A remarkable operation on the heart performed recently by a physician in Washington, D. C., in which an incision was made and the heart massaged, is creating widespread interest.

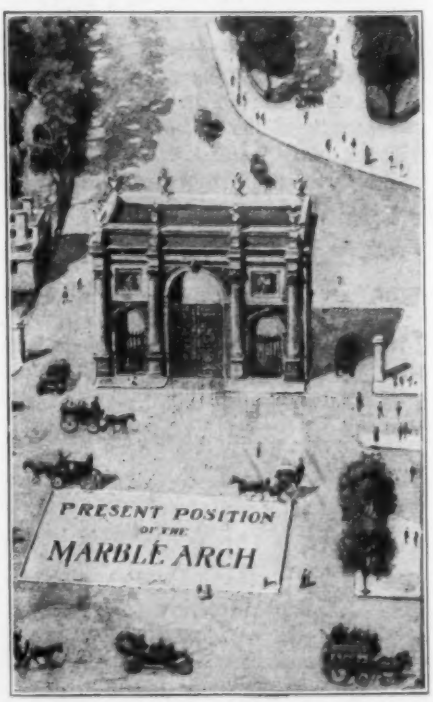
The case was that of a boy whose vital organs ceased to act during an operation which was being performed on his knee. After all other methods which surgeons employ to revive persons who succumb under anesthetics had failed, the physician resorted to the desperate means of making an incision in the boy's abdomen and massaging the muscles of the heart.

The drastic treatment restored him to life after, to all appearances, he had died while on the operating table, and he revived sufficiently to submit to the conclusion of the operation on the knee. He died, however, three days after the operation on the heart, but, according to the physician, might have lived had not blood poisoning, due to the infection of the knee, set in.

A number of such operations have been made in Germany and the massaging restored life for the time being, but there has been no case recorded where a revived patient has lived any length of time.

MAY MOVE THE MARBLE ARCH

The present position of the great Marble Arch (England's Arch de Triumph), which stands at the entrance of Hyde Park, London, is claimed to be one of isolation, and it is suggested that it be taken down and re-erected farther back at the entrance to the new



roadway. This would leave a fine open space opposite the new road, which might be planted as an ornamental garden.

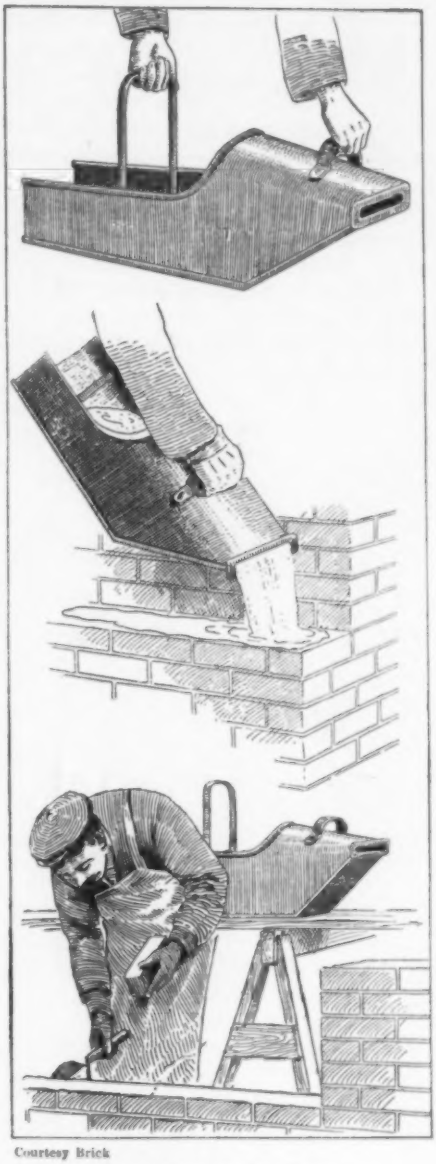
NEW TOOLS FOR LAYING BRICK

Bricklaying as an art has remained stationary for a long period of time. The methods of the past are still in vogue and present practice varies but little the processes by which the oldest brickwork now standing was laid. Progress in bricklaying is therefore to be more expected in the nature of improvement of existing methods than from attempt at radical change.

Two improvements recently made along this line are noted with interest. One is called the fountain trowel and the other is a packet system of handling the bricks. The trowel is a metal can, shaped something like a Dutch wooden shoe. The heel is used to scoop up mortar from the mortar box and the toe has a long opening the entire width of the can, through which mortar is poured upon the brick. This trowel or can makes it possible to spread a far greater quantity of mortar within a given time than the ordinary trowel, and permits the bricklayer to use mortar sufficiently soft to fill the joints better, not only because it runs down into the unfilled joints of the course below, but also because it permits the shoving of the joints full of mortar in the course that is being laid.

The packet is a little wooden tray, 30 in. long and the width of a brick. The bricks are placed on the packet, face up, in two rows of ten each, a weight of about 90 lb. The whole is placed on specially constructed wheelbarrows and wheeled to the place where the men are working. The packet is then lifted from the wheelbarrow, placed on the stock platform of the scaffold, and pushed over to the bricklayer. The bricklayer lifts the packet and deposits it on the wall. The last step, that of placing the bricks in the wall, requires but the moving of the arms and hands.

Everyone who has watched a bricklayer at work has noticed that he tosses a brick about in his hand before laying it. This is not mere play, but the necessity of grasping it in such fashion that he can lay its best face for the face of the wall. With the packet system the best face is always upward, and the bricklayer is spared this waste of energy and time. By the ordinary methods it is necessary for the bricklayer to stoop



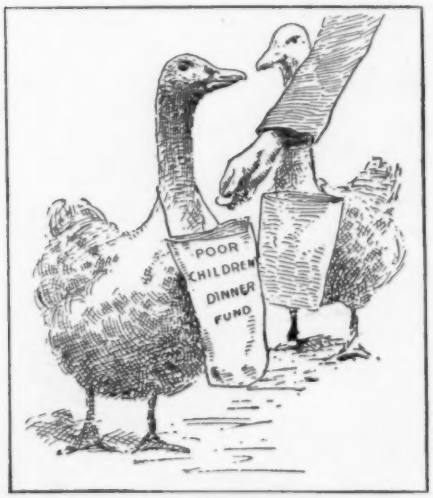
Courtesy Brick

New Labor-Saving Tools

over the scaffold on which he stands and then straighten up with no more work accomplished than lifting two bricks; another waste of time and energy that such a system as the packet makes unnecessary.

GOOSE COLLECTS FOR CHARITIES

One of the sights of the central markets in London is a goose that collects money for charities. It is a remarkably

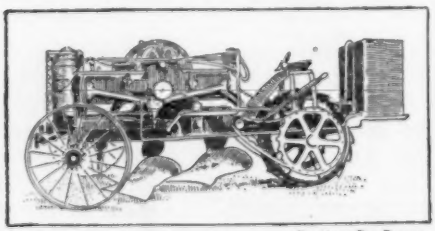


A "Golden Goose"

intelligent goose, answering to the name "Patsy III," and recently collected $10 for a dinner fund for poor children.

MOTOR PLOW OF INTERESTING DESIGN

This machine was designed by an Illinois inventor, who has successfully used it on his farms. It weighs 4,000 lb., is driven by a 2-cylinder opposed motor at a fuel consumption of 2 gal. an acre, and will, it is claimed, plow an acre of black gumbo soil an hour.



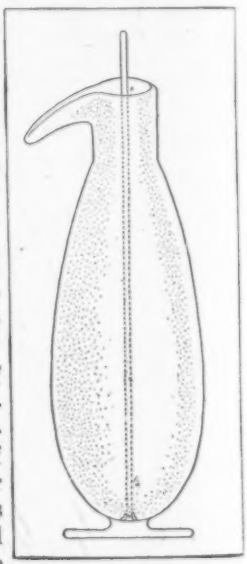
Courtesy Gas Power

Gasoline Motor Plow

It differs from other machines made for the same purpose in that it uses but one driving wheel and carries the plows underneath the machine. The long lever shown at the left of the driver's seat is used for lifting the plows and setting them in the ground. The inventor claims that, as there is only one wheel running over the land plowed, the effect on the soil is not as bad as that caused by the tramping of horses.

HATCHING JAR AUTOMATICALLY SEPARATES DEAD FROM LIVE EGGS

This jar for the hatching of fish eggs is automatic to the extent that it separates the live from the dead eggs. The design is such that the currents of water cause the good eggs as they come to the top to be thrown inward and downward toward the center, while the lighter and poorer eggs rise to the surface, where they are easily removed or flow off of their own accord.

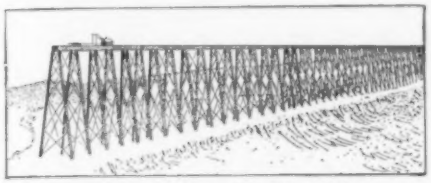


The form of the new hatching jar is identical with that of other jars as far as the bottom is concerned, and also has the same outline for about one-third the distance up the sides. It is then gradually drawn in or made smaller, until it ends in a straight and comparatively narrow neck some 4 in. in length. One side of this is the glass overflow, which is twice as long as that on most forms.

The jar was used throughout the winter hatching season in Detroit, and in operation worked even better than had been anticipated.

LONG RAILROAD BRIDGE IN QUEBEC

The National Transcontinental railroad of Canada is constructing a long railroad bridge over one of the small river valleys near the city of Quebec.

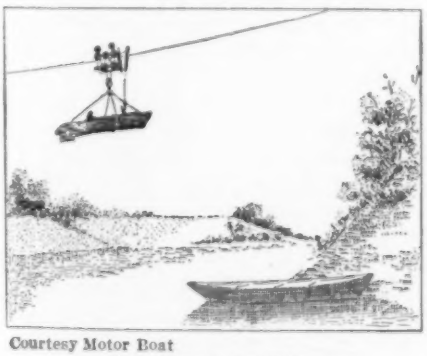


3,340 Ft. Long: 140 Ft. High

The length of the bridge is 3,340 ft., composed of one 200-ft. span, thirty-one 60-ft. spans, and thirty-two 40-ft. spans. Its average height is 140 ft., but directly over the river it has a height of 165 ft. Its top width is 16 ft. The photograph was taken in winter. The cost of the bridge will be $500,000.

AN AERIAL LAUNCHING

The wide stretches of shallow water on each side of the Connecticut river at this point made it necessary to launch this 20-ft. motor boat in the manner shown. It is another use for the aerial cableway.



Courtesy Motor Boat

A Unique Launching

LASTING QUALITIES OF CYPRESS

During the excavation for a sewer system in the older portion of New Orleans quite a number of unknown and forgotten burial grounds were discovered, and many coffins, constructed of cypress, dug up in perfectly sound condition. Some of these, from the coins and buttons found, undoubtedly contain the remains of Spanish soldiers.

One of the coffins discovered bore the inscription, "Hendric Miller, 1803," carved in the wood. This coffin, except for the discoloration of the wood, was

Courtesy Florists' Review

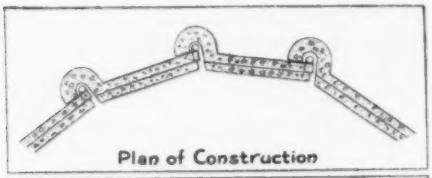
Relics of Cypress Casket

as sound as the day it was made. In the illustration is shown the end board of the coffin, a portion of which has been surfaced to show the grain. The illustration also shows the skull of Hendric Miller and the iron cross which was undoubtedly on the casket. The latter is so rusted that only a few letters are decipherable. The hand-forged nails used in the construction of the coffin were not rusted where driven into the wood, a circumstance not at all in accordance with the theory sometimes advanced that cypress contains an acid which will rust nails.

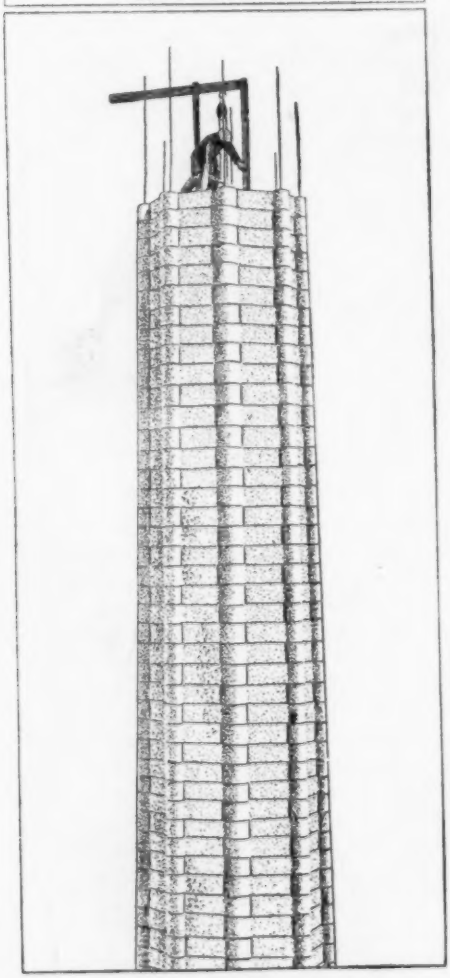
A $5,000,000 fire recently destroyed the main telephone exchange in Paris.

A CHIMNEY OF CONCRETE BLOCKS

A Brussels inventor has devised a novel system of construction of concrete chimneys, in which, although the concrete is in blocks, reinforcement is used. One of the most interesting features of the method is the fact that the chimney can be built without the use of scaffolding.



Plan of Construction



Reinforced Concrete Block Stack

The concrete blocks are of large size, permitting rapid construction, and the provision for securing the taper in the chimney construction is particularly ingenious. The cast-iron sides of the molds in which the blocks are made are in three pieces only, and the ends of the molds are formed by wooden stop-blocks. By adjusting the position of these stop-blocks, the length of the concrete block can be altered to suit the course in which it is placed, thus securing the taper of the chimney without multiplying the number of molds. The chimney is polygonal in cross-section, and may be built with 6, 8, 10, 12 or more sides, according to the size of the structure.

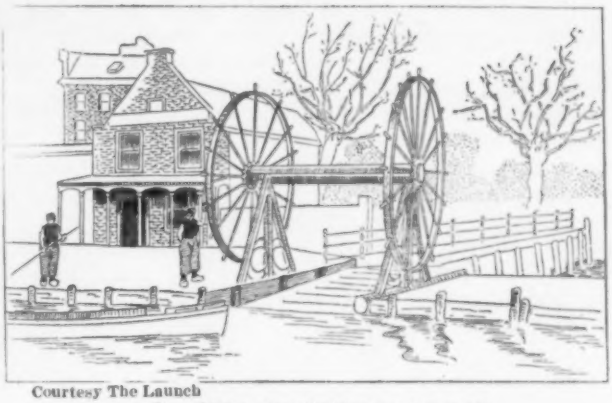
The diagram, which shows a partial cross-section of the chimney, illustrates how, by varying the circular lap of the shank of the block past the semi-circular lip of the adjacent block, the diameter of the circle is drawn in at each successive course. The blocks are reversed in each successive course, so that the joints are properly broken. The largest blocks used are nearly 3 ft. in length, and the distance across the semi-circular opening is 6 to 8 in.

The vertical reinforcing rods are placed in the semi-circular openings, and may be seen projecting in the illustration showing the chimney under construction. To provide for circumferential reinforcement, there is placed on the bottom board on which the blocks are molded a wooden strip of triangular cross-section. This leaves a V-shaped groove in the block, in which a rod or wire may be placed. It is claimed that there is no difficulty in proportioning the reinforcement to the stresses to be sustained, and it is obvious that the vertical rods are so placed as to be less exposed to the interior heat than is ordinarily the case.

The large size of the blocks and the fact that they are erected without scaffolding, enables the chimney to be constructed with a small working force and with great rapidity.

THE WATER LOCKS OF AMSTERDAM

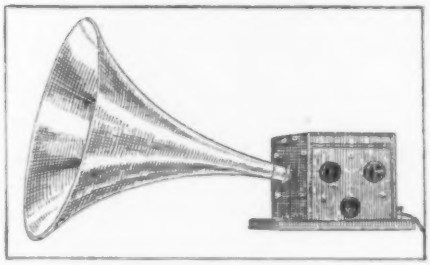
This peculiar looking lift is in Amsterdam and is used to raise boats from the low water in the polder to the higher level of the city. It is hand operated, the large wheels on each side being for this purpose. The motor boat shown is American made.



Courtesy The Launch
The Boats Are Hoisted or Lowered

A LOUD-SPEAKING RECEIVER

The feature of this instrument is that it has two diaphragms, separated by a thin annulus, which are caused to vibrate in synchronism in opposite directions. This causes a certain volume of air to be alternately admitted and expelled, thus making a sound of great amplitude. It is the invention of an English electrician.



It Has Two Diaphragms

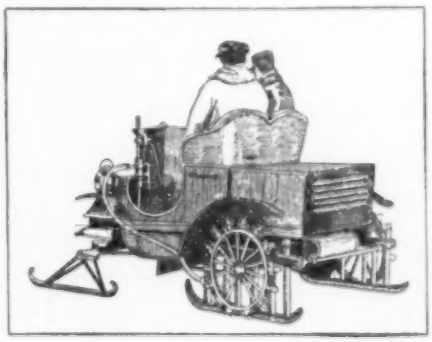
TO STOP PRIVATE FIREWORKS DISPLAYS

According to newspaper reports, the fire chief of the New York department is advocating a law that will absolutely stop all private fireworks displays on the Fourth of July, and allow only public exhibitions, handled by professionals. It is claimed that he will try to get a law passed to stop all private sales, believing it the only move that will safeguard property and lives.

AN AUTOMOBILE ON RUNNERS

This illustration shows an automobile, with the usual supporting and drive wheels removed, equipped with specially devised runners and drive wheels for winter service.

The rims of the drive wheels are provided with a number of knobs or blunt spikes to enable them to catch hold of the surface over which the car is running. The rear runner on each side composes the lower part of the framework on which the drive wheels are set, and between them and the upper part of the frames are interposed eight hydraulic jacks, four on each side. These are under control of the driver and are for the purpose of throwing the drive wheels into or out of operation, or to any intermediate position made necessary by the condition of the road surface.



For Travel on Ice

It is claimed that the machine will travel on bare ground as well as on snow, that it is especially adapted to climb hills, and, by raising the driver, to coast down, and that it will drag a snow plow through snow over which an ordinary automobile could not run alone.

The machine shown was made for experimental purposes only, and as all parts were home-made, is crude. The hydraulic jacks are worked by the hand pump shown just forward of the seat.

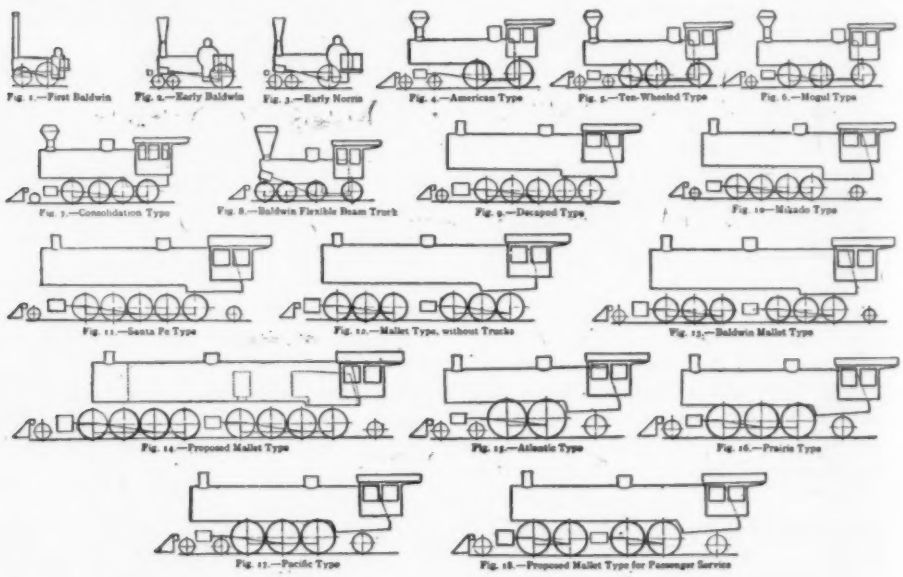
THE GROWTH OF THE RAILROAD LOCOMOTIVE

When locomotive builders started work they used as few wheels as possible. The first engine had one pair of drivers to make the engine move and one pair of carrying wheels to keep it on the track. The boilers were built as small as possible to do the work and were placed between the wheels.

The first engine of one of America's first locomotive constructors had the firebox placed back of the driving axle. In subsequent engines the firebox was located ahead of the driving axle. Another builder placed the firebox so it would overhang back of the driving axle, which proved a decided advantage in locomotives with a single pair of drive wheels, as it increased the proportion of weight on the drivers and so by obtaining increased adhesion it was possible to haul more cars without increasing the total weight of the engine.

An important step in advance was the introduction of a four-wheeled truck which enabled the engine to take curves easier. Later on, an additional pair of driving wheels was placed behind the firebox. This arrangement resulted in the American type of engine.

Another construction engineer conceived the idea of increasing the number of drive wheels to add to the proportion of weight available for adhesion. Still another concluded that it was necessary to carry just so much dead weight on the track, and proposed substituting a 2-wheeled truck, placed forward on the cylinders, to take the place of the 4-wheeled truck previously used. By this means the proportion of weight on the driving wheels was again increased and the first mogul locomotive developed. The next



step was the addition of a fourth pair of driving wheels, thus forming the consolidation type. The illustrations, which were drawn on a blackboard by S. M. Vauclain, probably the greatest authority on locomotives in America today, to illustrate one of his papers read to engineers, tell the whole story.

In this way, step by step, has the powerful locomotive of today evolved from the first crude railroad engine, and in the same way will coming years bring forward locomotives much more powerful and finished than the product of today.

DUELING WITH WAX BULLETS

Great interest was taken in the bloodless dueling tournament at the Olympic games in which the international

Bloodless Duel

revolver and pistol championships were contested for. Wax bullets were used, but the combatants were as elaborately protected as a German student duelist, and even the revolvers were equipped with large hand guards. Windows of plate glass were arranged in the helmets.

RAILROAD OF TWELVE TIES AND FOUR RAILS

In order to hold its charter, the Pittsburg & Northeastern Railroad Co. has built in Loyalhanna township, Pennsylvania, what is undoubtedly the shortest railroad in the country. The road is composed of 12 ties and four rails, enclosed by a wire fence. The complete road is expected to be built in about two years.

ONE OF THE LONGEST WHARVES IN THE WORLD

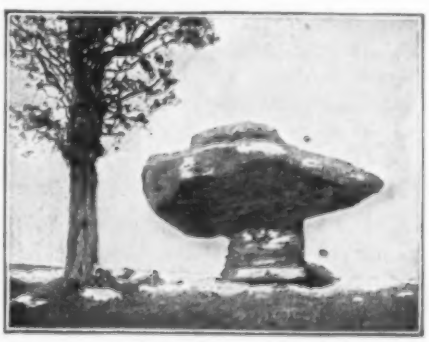
This long ocean wharf, built at Santa Monica, Cal., as a landing for steam-

Nearly a Mile Long

ships, is to be used as a pleasure pier, owing to the fact that the vessels formerly using it now make port at San Pedro. It only lacks 100 ft. of being a mile long, and an electric railway runs out to its end.

A TOADSTOOL-SHAPED ROCK

This curiously shaped rock is composed of three parts, the base being 5 ft. in height by 4 ft. in diameter, the middle stone 16 ft. in diameter by 6 ft. in height, and the top stone 5 ft.

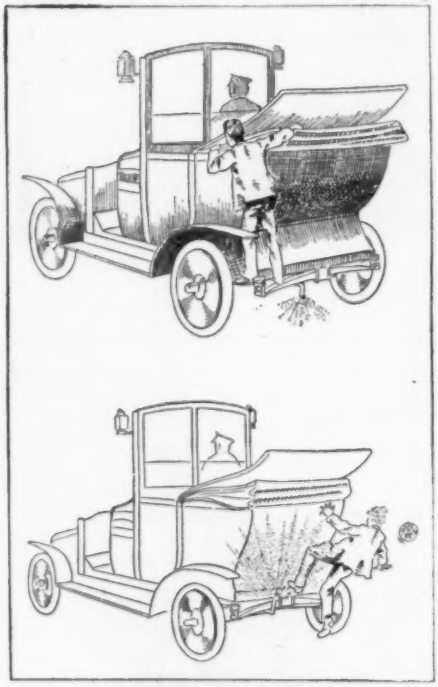


Possibly Erected by Man

square by 5 ft. high. The rock stands on a high hill about 5 miles north of Wheeling, W. Va., and by many is supposed to have been placed there in pre-historic days.

ANOTHER ENGLISH MOTOR SUGGESTION

The youths of England, not at all different from the American species as far as general characteristics are concerned, have been bitten with the desire to "catch on" to the rear of every

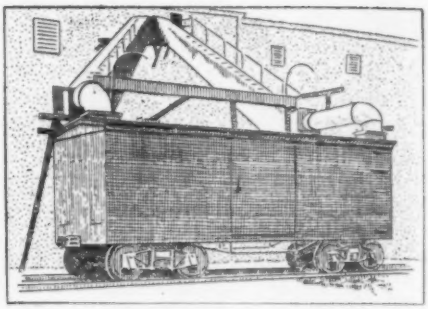


The "Tip-up" Exhaust

automobile which offers a comparatively safe footing, much to the annoyance of the occupants. A "tip-up" exhaust is suggested as a means of remedying the evil.

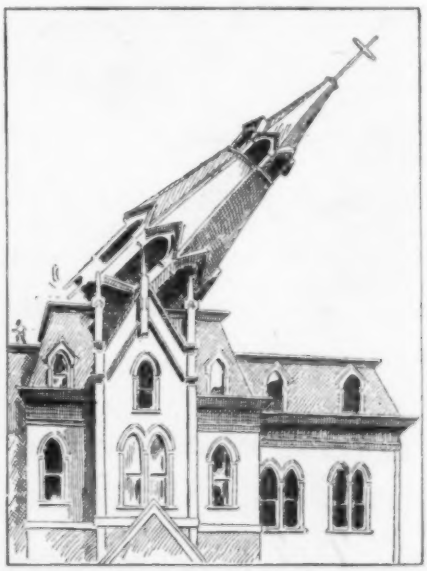
PRECOOLING ORANGES IN CARS

This experimental plant for the precooling of oranges in cars is located at Los Angeles, Cal., and consists of two 30-in. square insulated ducts leading from an ammonia coil room capable of



Loading Car with Cold Air

supplying from 16 to 20 tons of refrigeration in 24 hours. The cold air is forced in either direction through the car and back to the coil room by a motor fan. In experiments the air was varied from 20 deg. F. when first entering the cars to higher temperatures. The air is forced through the cars at different velocities and in volume varying from 4,500 to 6,000 cu. ft. per minute.—By courtesy of Ice and Refrigeration.



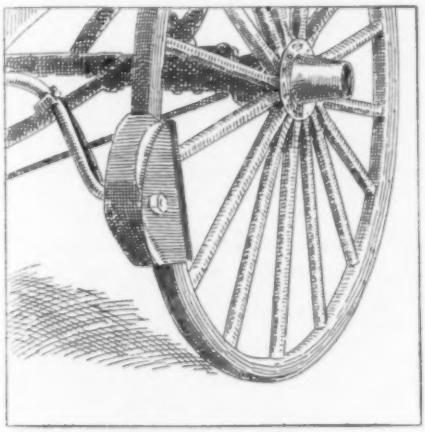
"WRECKING" AN OLD SCHOOL BUILDING

This illustration shows a gang of "wreckers" razing the Academy of Holy Name in Seattle, Wash. It was built

nearly 30 years ago, and as the steeple fell a number of the Catholic sisters who had spent most of their lives within its walls wept at its destruction. More than 5,000 girls have passed a considerable portion of life in the building, but during its many years of service not a death occurred within its walls. A much larger building will take its place.

A SPRING BRAKE-SHOE

As ordinarily made, brake-shoes wear much faster on the upper than on the lower half. This is overcome by placing

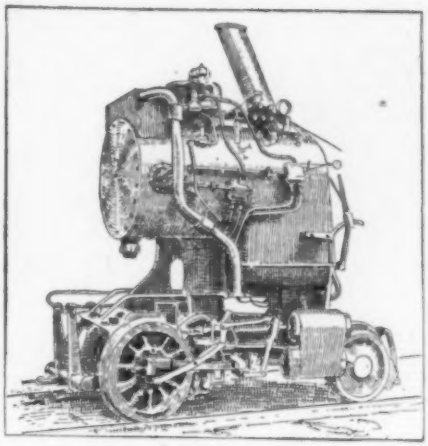


Improves the Brake

a spring so as to press the lower portion to the wheel rim. The spring is 12 in. long by $\frac{1}{4}$ by $\frac{1}{8}$ in.

OIL-BURNING STEAM MOTOR CAR

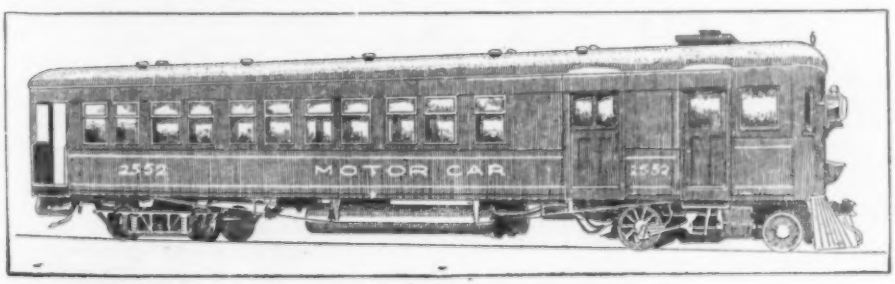
A 250-hp. oil-burning steam motor car was recently completed for the Chicago, Rock Island & Pacific railroad. The car body is of steel construction throughout, with the exception of the interior finish, and is divided into three compartments, an engine room, baggage room and passengers' compartment, the latter having a seating capacity of 40 persons.



Oil-Burning Engine

In test runs the car has made a speed of 60 miles an hour. The power unit, shown in one of the illustrations, looks curious, but this, of course, is because it is not in position within the car. In the design of the boiler the problem of providing the required amount of heating surface within the necessarily limited space available has been very satisfactorily solved.

The fuel oil is carried in a 100-gal. tank in the engine compartment. The water supply is carried in three tanks, having a total capacity of 1,000 gal., suspended beneath the car midway between the trucks.



A STREET OF CONCRETE

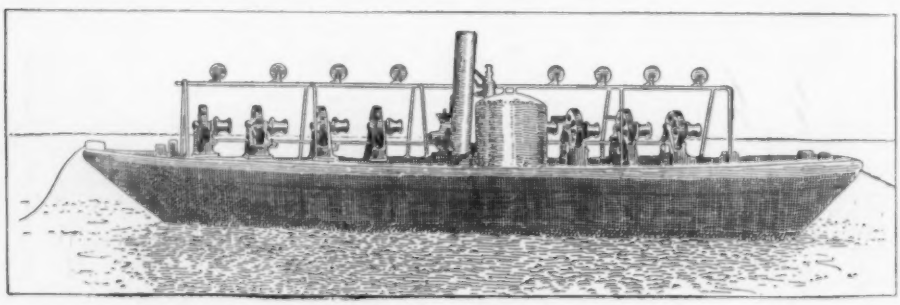
The pavement, curbing, sidewalks, and inner curbing of this Californian street are all built of concrete, presenting a fine example of the progress of the concrete industry in the west. It is claimed that concrete makes the best possible pavement for automobile traffic, and that when the time comes when the horse is almost completely relegated to the past in favor of automobiles, such a street will be in general use and practically dustless.

ENGLISH STEAM-WINCH COALING-BARGE

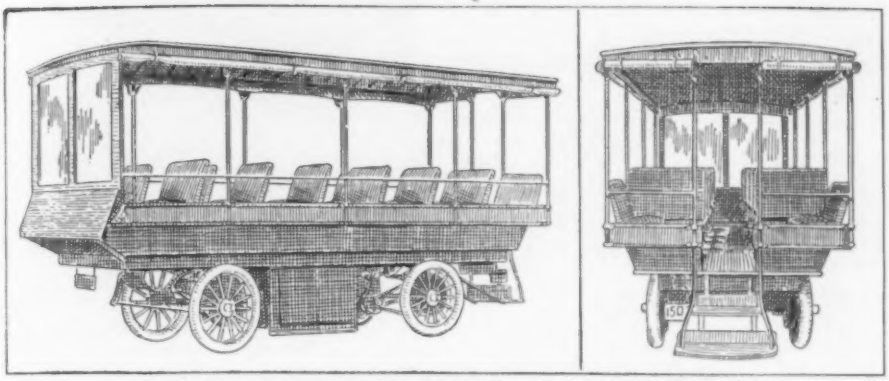
One of the most satisfactory and quickest-working devices for coaling vessels in a harbor is this new English steam-winch coaling-barge. It has eight winches, driven on one line of shafting, and works coal on board a ship at the rate of 105 tons per hour. It loaded 1,100 tons of coal on board the British cruiser "Roxburgh" at the rate of 107.3 tons per hour. In doing the work the coal barges are placed alongside the ship to be loaded and the steam-winch barge is made fast outside the coal barges.

The row of winches is placed to one side of the center line of the barge, and the vertical boiler is placed in a well towards the other side. The winches are direct-driven by a 38-hp. horizontal compound engine. The barges are 58 ft. long, 8 ft. in depth, and have a beam of 17 ft. They have a registered tonnage of 43½ tons.

More than 10,000 tons of coal in the yards of the Southern Pacific Railroad at Reno, Nev., was recently ignited by the sun's excessive heat. Continued warmth was the cause of the spontaneous combustion.

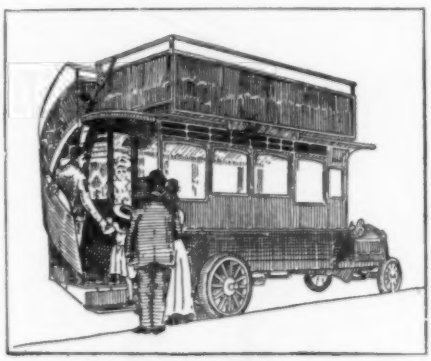


Loads 100 Tons of Coal an Hour



ELECTRIC OMNIBUSES IN AMERICA

The omnibus, for so many years the only practical means of public transportation in London, Eng., has become quite popular in New York and Philadelphia since motors were substituted for horses. It was not longer ago than 1907 that the first serious attempt at



Double Deck Car

motor omnibus operation on a large scale in this country was made, and the success so far has excited a great deal of interest among those identified with passenger transportation.

At the present time there are at least 60 motor omnibuses operated by one line in New York and a number more in Philadelphia. The bodies of the New York omnibuses are of the same style as those used in London. They are what are called "double deckers," the top or outside having a seating capacity of 18 and the inside 16. Smoking is allowed on the top. The roof seats are placed transversely and are of special design. The curved stairway is made of light steel with wooden steps. Hand rails are provided on each side. The bodies are easily removable, having no connection with any part of the mechanism.

The Philadelphia omnibuses are of purely American design and have been found satisfactory and popular in every way. Unlike the New York omnibuses, they have only one deck, but this is arranged to seat 26 passengers. The seating arrangement includes 12 transverse seats and two side seats. One of the transverse seats is occupied by the driver.

AN ALPINE CLIMBER'S SHOE

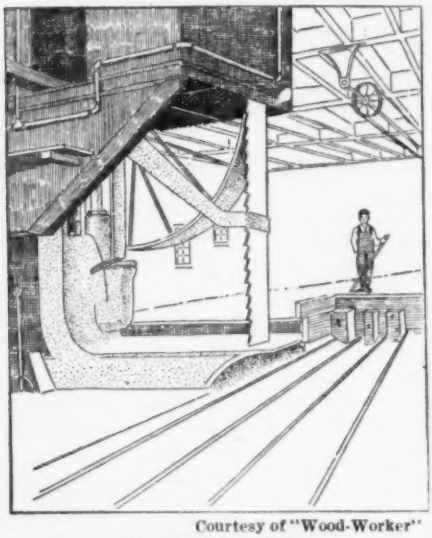
Safety in climbing icy mountain peaks depends more, probably, upon the way the climber is shod than any other part of his equipment. The shoe shown

Has Ten Sharp Points

in this illustration is not only heavily nailed but fitted with a 10-pointed crampon to insure a better hold on icy surfaces.

LARGEST BAND SAW EVER MADE

The largest band saw ever used is 20 in. wide and 65 ft. long and has an



Courtesy of "Wood-Worker"

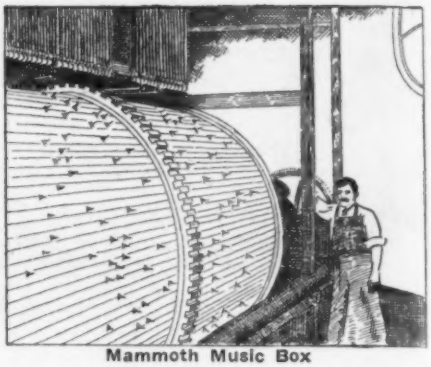
Saw Is 65 Ft. Long

11 gauge with teeth spaced 3 in. apart. It is doing regular service in a lumber mill at Hoquiam, Wash.

The great element of success in the use of such a huge saw is the vigilance of the filer in examining it after every run for development of "fast" places. Only by this means can the saw be kept in perfect condition, for if it is left until poor work is showr it may get beyond control and the entire saw be ruined.

MECHANISM OF THE BRUGES BELLS

The famous peal of bells at Bruges is played on the principle of a music box, with an enormous drum weighing 2,000 lb. In the drum are 30,000 holes for brass pegs which touch the trackers and move the wires communicating

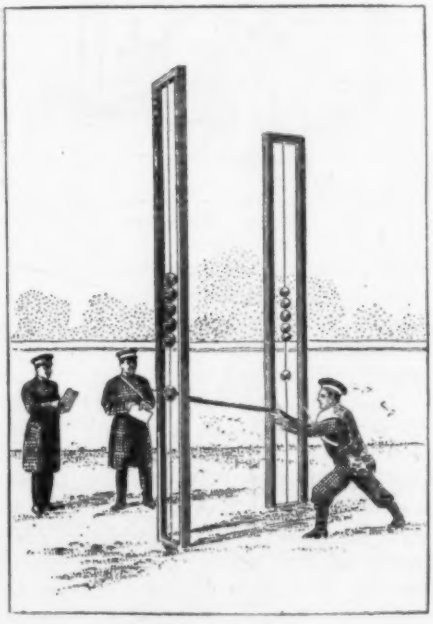


Mammoth Music Box

with the bell-hammers. The airs are changed once each year, but the drum must be wound up every two hours.

RUSSIAN ARMY BAYONET PRACTICE

Stabbing the ball is one of the methods by which the Russian soldiers are being taught accuracy with the bayonet. Balls of straw are allowed to slide down a wire, and a soldier in full marching kit endeavors to stab as many as he can in the descent.

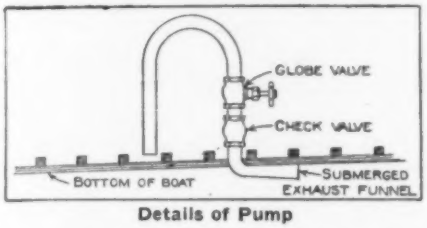


"Stabbing the Ball"

SHOP NOTES

Automatic Bilge Pump for Boats

This device consists of a submerged exhaust funnel fitted to the planking aft and under the flat stern. A check valve, globe valve and a bent half-circle of pipe, as shown in the sketch, com-

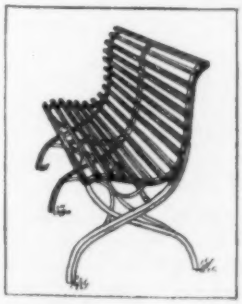


Details of Pump

plete the novel pump. When speeding the bow rises up causing the bilge water to run aft to where the pipe is fitted, the suction of the water rushing by the funnel draws the air out of the bent elbow of the pipe and starts the water flowing from the inside out just as a siphon works. As long as there is water covering the inside end of this pipe and the boat is running to produce a suction, the water simply leaks in, runs aft and is siphoned out again automatically. When the boat stops the "pump" stops. —C. G. Davis, in Motor Boat.

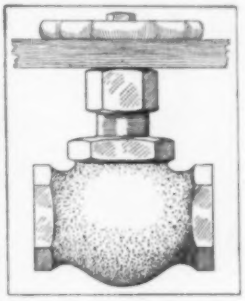
An Angle Iron Settee

The supports of this settee are made from 1-in. angle iron bent in the proper shape, as shown in the sketch. The wooden strips forming the seat are $\frac{7}{8}$ by $1\frac{1}{4}$ in., and fastened to the angle iron supports with common stove bolts. The braces for the supports are made from $\frac{1}{2}$-in. round iron. Three pieces are used between each support. The ends of the angle iron at the bottom should be turned to form a surface that will prevent its settling in the ground.



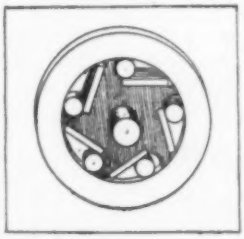
Turning a Damaged Packing Nut into Place

When a packing nut on a globe valve becomes damaged so that the threads will not follow their course, place a piece of wood between the hand wheel and the nut, as shown in the sketch, and turn both at once. This will greatly assist in turning the nut down to its proper place.—Contributed by Henry H. Brand, Silver Creek, N. Y.



An Indestructible Ratchet for Wave Motors

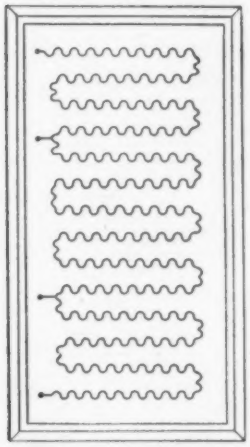
The accompanying illustration shows the construction of a ratchet that is practically indestructible. It consists of a serrated segment with hardened steel plates and solid rolled steel rollers, one of which is always in action on the right-hand side. Gravity keeps the roller in the wedge-shaped place, momentarily locking the device. When worn, new plates can be placed in. This style of a ratchet has been used suc-



cessfully on large wave motors. When used on wrenches, small springs will keep the rollers in the wedge-shaped opening and in a locking position.

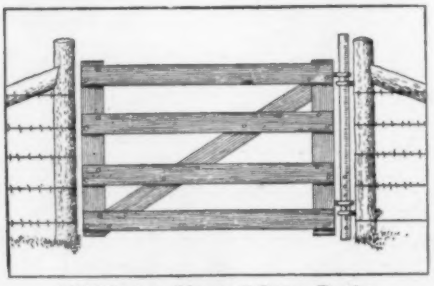
Repairing a Rheostat

During the operation of a machine propelled by an electric motor one of the rheostat plates burned out, says a correspondent of Practical Engineer. As it was necessary to have the machine in operation as soon as possible he could not wait for a new plate to come from the factory. A hardwood board was secured, 1 in. thick, 11 in. wide and 26 in. long, and covered with asbestos. A german silver wire was placed on the board, as shown in the sketch, and this board put in the place of the plate burned out. This repair has given good results for more than six months.



A Gate for Snow Banks

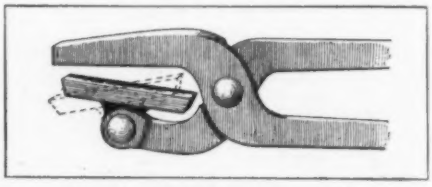
The drifting of snow about fences will cause trouble in opening gates when the snow becomes packed. A gate that may be used under these circumstances is hung on hinges made from eye-bolts. One pair of eye-bolts are fastened to the gate and the other to the post. An old shaft or gas pipe is fitted to the eyes of the bolts as shown in the sketch. Holes are drilled at intervals in the bottom of the shaft or pipe in which to insert pins. The whole gate may be lifted to such a height that it will swing clear of a snow bank. A pin is inserted beneath the lower eye-bolt of the gate when the right height is attained.



Will Swing Clear of Snow Banks

Tongs for Wedge-Shaped Iron

The accompanying sketch shows the construction of tongs to hold wedge-shaped metal. One of the jaws is made with a hinge joint in the middle so it will tilt either way, says a correspondent of Blacksmith and Wheelwright. These tongs will hold either end of a wedge.



For Handling Wedges of Iron

Steady Power from a Windmill

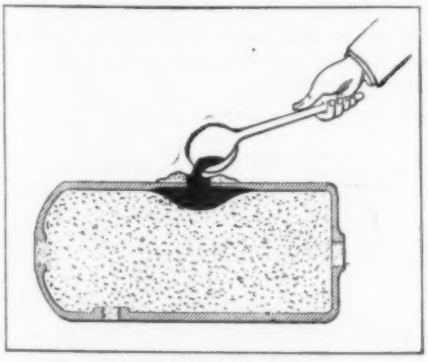
The windmill is used but very little for purposes other than pumping water. This is on account of the unsteady power. Here is a description of a device showing how in one instance this disadvantage was overcome. The rod that connects the pump to the pitman on the mill was removed and replaced with a shorter rod to connect with an air pump. The air pump that was used has a 3-in. bore and the stroke of the pitman is 6 in. The wheel of the mill is 12 ft. in diameter. This arrangement pumps air into a battery of 25 tanks, such as are used for hot water boilers, to a pressure of 150 lb. A safety valve is used and set to release at the above pressure. An ordinary steam engine of 2-in. bore and 3-in.

stroke is used, the air passing through a very hot pipe before entering the engine. This causes the air to expand and prevents freezing which is caused by the moisture in the air. An air-tight swivel joint is provided under the mill to allow the wheel to adjust itself as the wind changes direction. This gives plenty of power to run a lathe and has seldom failed to pump the tanks to full pressure every day.—Contributed by L. G. Stepzinski, Peoria, Ill.

How to Repair a Broken Lubricator Cup

When casting lubricator cups sometimes they are made thin on one side, due to the shifting of the core when pouring the metal. This was the case of a cup which caused a burst, making quite a large opening from which ran cracks up and down the cylinder, says Power.

The repair was made by plugging up the cup full of clay and a cavity made by digging out some of the clay behind all of the weak and injured portion, taking the clay out through the opening. A ladleful of melted babbitt was poured into this cavity, forming a button over the fracture inside the cup. The gate was cut off with a hacksaw and the cup smoothed up with a file,

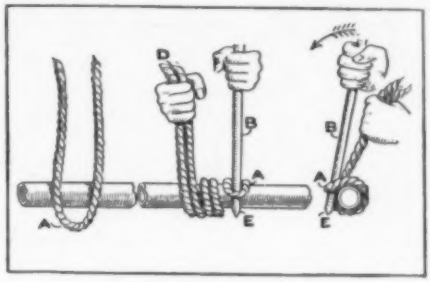


Pouring the Babbitt

the clay removed and the cup put in place. The lubricator works as good as a new one.

How to Turn a Pipe Without a Wrench

A piece of rope makes a good substitute for a pipe wrench if used as shown in the accompanying sketch. Double the rope and form a loop, A, in the middle and wind it around the pipe



Will Not Crush the Pipe

a couple of turns, pass a bar or piece of pipe, B, through the loop with its end, E, against the pipe as shown.

Hold the end, D, of the rope taut and push the handle end of the bar in the direction as shown by the arrow. This will tighten the rope and make it grip the pipe which will turn in the direction the bar is pushed. Slack up on the bar and rope and bring them back again to the first position for another grip. Repeat the operation until the pipe is turned out or in. This device will turn a pipe as well as a pipe wrench and will not crush the pipe.

How to Make a Hole in Glass

Cover the glass with clay or putty for a few inches around the place where the hole is wanted. With a pencil or small stick make a hole in the clay or putty the size of the hole required. Pour this hole full of melted lead. The hot lead will go through the glass and duplicate the hole in the clay.—W. O. H.

When opening up a boiler in which kerosene has been used, never use lights in or near it until the interior has been thoroughly aired out.

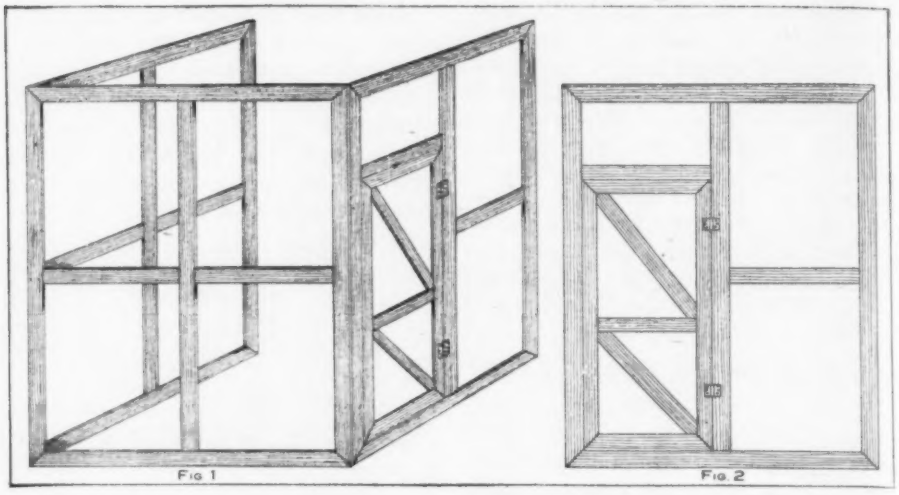


FIG. 1 FIG. 2

How to Make a Storm Entrance

Where a door side of the house is exposed to the wind, a storm door or entrance is a very necessary adjunct during the winter months. The object of this article is to show how to build a storm door or entrance enclosure from cloth. This is an easy thing to make and presents a very good appearance when finished and painted.

The frame consists of 2 by 3-in. white pine surface on one side. The lumber can be ordered from any planing mill. Fig. 1 shows the general arrangement of the frame. The height is made to fit neatly between the porch floor and the ceiling as are also the two sides. The joints are mitred at the corners and nailed with finishing nails. The middle piece is cut to fit neatly and toenailed in place. The back and the sides are screwed to the floor with wood screws that pass through the frame. This allows the frame to be readily put up for the winter and taken down in the spring. Fig. 2 shows the construction of the door section. The door is made 30 in. wide by 6 ft. high and swings outside on a pair of hinges. A knob is used on the outside of the door for opening. A spring pulls the door and holds it shut. A wooden turn latch locks the door from the inside.

The plan view, Fig. 3, shows how the corners are screwed together and how the sides are fastened to the house with wood screws.

The entire outside is covered with heavy unbleached muslin and is fastened to the frame with tacks. The muslin comes a yard wide and must have lapped seams which are sewed the entire length. The cloth is tacked all around the outside and over the cross pieces. The cloth is then given two coats of paint and tinted the same as the house. This storm door or entrance is nice and light inside, is easily put up and taken down and presents a neat appearance when finished.

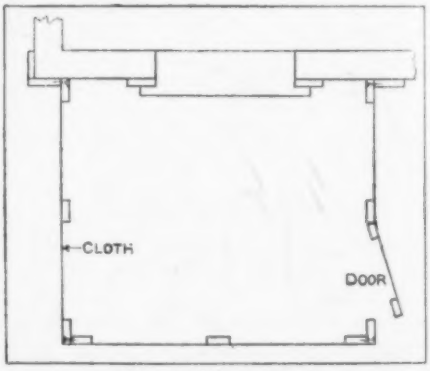


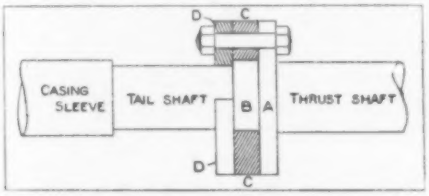
Fig. 3—Storm Door

A New Keyless Loose Coupling

By Capt. A. B. Willits

The accompanying illustration shows the construction of a novel loose coupling for use in small steamers and launches where the withdrawal of the tail shaft having a solid flange coupling usually necessitates the removal of the engine machinery. The peculiarity of this coupling lies in its being keyless.

A portion, B, of the forward end of the tail shaft is turned to a larger diameter than the shaft (not to exceed the diameter of the tail shaft casing or journal at stem bearing), and out of center as much as will give all the eccentricity possible with such increased diameter without quite fairing it at any part of the circumferenec with the tail-shaft surface. The loose coupling, C, is turned to an outside diameter exactly equal to that of the solid coupling, A, of the crankshaft, and is then bored



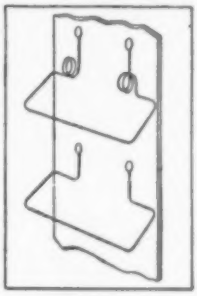
Details of a Coupling

eccentrically to the exact amount and with the same diameter as the eccentric portion B.

Center lines are permanently scribed on the forward end of the tail shaft and on the loose coupling disc before eccentric turning and boring are done, the new centers being in these lines in both cases. This permits the ready adjustment of the coupling disc, C, on the eccentric, B, without disturbing the alignment of tail and thrust shaft when bolted up, and with the disc C snugly and properly in place the coupling bolt holes are drilled and reamed out true and fitted with bolts. Two half discs, D, are fitted snugly to the tail shaft diameter, facing against the lips of the eccentric B and the loose coupling, and holding the shaft from pulling out when backing. These also prevent the tail shaft from turning on its axis around the axis of the eccentric, and these half discs, therefore, must be fitted up and bolted as accurately as are the couplings. To draw out the tail shaft all that is necessary is to remove the coupling bolts from the half discs.

How to Keep Elevator Legs Clean

The accompanying illustration shows the manner of making and applying to elevator belts the best device for keeping clean elevator legging that is inclined to become foul from moisture and accumulated dust, says the American Miller. The wire is so bent as to make it barely touch the leg on all sides. Two styles may be used, either with a coil or straight springs, as shown in the sketch. They are fastened to the belts with elevator bolts. The wire should be about No. 9 in size.



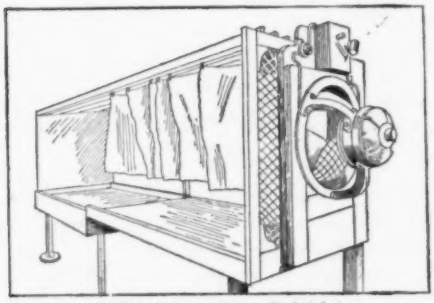
Treatment of Fading Blueprints

If it is found that blueprints from a certain lot of paper are apt to fade in sunlight or even in a strong light without being in direct sunlight, the following remedy is recommended by the American Machinist:

Expose the prints until badly burned and then wash in clear water until all the emulsion is removed. While still wet lay print with the blue side up on a smooth surface and by means of a paint brush cover the print smoothly with peroxide of hydrogen. This will bring out the background very blue and the lines perfectly white, and make a print that will not fade to any extent in the sunshine.

Drying Blueprints with an Electric Fan

A quick way to dry blueprints is by the use of an electrically operated propeller fan, as shown in the accompanying illustration. The fan is mounted in



Dries Blueprints Quickly

one end of a long frame, in which the blueprints are hung up ready to dry. It would ordinarily require several hours for the prints to dry out by themselves, but with the aid of the propeller fan the air may be circulated around the prints so rapidly that they will be dried in a small fraction of that time, says Popular Electricity. As shown in the sketch, the fan is mounted in a circular opening in the end of the frame. The motor is attached directly to the shaft of the fan.

Making Hay Caps

Make the cap of the size to suit, but large enough to cover a shock of wheat or oats, from 8-oz. duck. Get good cloth, muslin, if you cannot use duck; make the holes and buttonhole-stitch them for the tying cords; then paint with waterproofing material. The best and the cheapest, as well as the most easily applied, material is a mixture of paraffin dissolved in gasoline. Apply this solution to the cloth with a whitewash brush, and keep it well away from the fire. The gasoline will evaporate, and the paraffin will coat the cloth and make it waterproof. Get paraffin with high-melting point. Such a hay cap is very inflammable, and must be kept away from sparks or flame.

If the cloth is white and it is desirable to keep it white, and the expense is not considered, it might be well to paint with a mixture of sugar of lead and alum, in the proportion of 1 lb. of sugar lead to 5 lb. of alum, dissolved in 7 gal. of water. In either case repaint each spring.

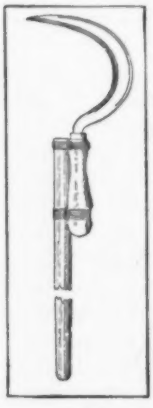
It is best to thoroughly dry them out before putting away for the winter, says the Country Gentleman. The trouble is that most people will not properly care for the caps when through using them. They may seem rather dry, and there is no time to waste, so they are chucked away damp, and soon mildew, mold and spoil.

How to Find Small Leaks in Pneumatic Tires

A small leak in an inner tube is often hard to locate, more so at night. Place an incandescent electric light in the bottom of the water tub and the slightest bubble will show up plainly. It is a general supposition that the light will explode if placed under water, but it will not. Try it. I have used this method for several years.—Contributed by E. W. Smith, St. Catharines, Ont.

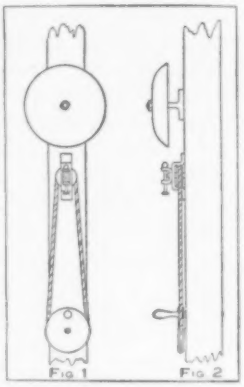
Extension Handle for a Sickle

Grass or weeds that are too high to be cut with a lawn mower must either be cut with a scythe or hand sickle. If a scythe is not at hand the sickle will cause a backache if used for any length of time. The handle of the sickle should be lengthened, as shown in the sketch, and it can be used without stooping. The handle of the sickle is cut with a slight hollow to allow a broom handle to fit it nicely. The two handles are then bound tightly together.—Contributed by S. R. Speirs, St. Louis, Mo.



Gong for Sounding Working Hours

In a certain machine shop an electric gong had been used to sound the working hours. The occasional renewal of the batteries prompted one of the men to construct a bell-ringing device which he made in spare time from odds and ends. Two grooved pulleys of different diameters were suitably fastened to a post, on which the gong was attached and connected by a belt of sash cord. Rotating with the upper and smaller pulley is a fork in which slides the bar having the bell hammer on one end. This pulley is so set that when it revolves centrifugal force throws the ball out far enough to just nicely strike the gong. A vigorous turn of the handle on the larger pulley causes the gong to ring with no uncertain sound. Fig. 1 shows the front and Fig. 2 the side view.—Contributed by Donald A. Hampson, Middletown, N. Y.



Steel Belting

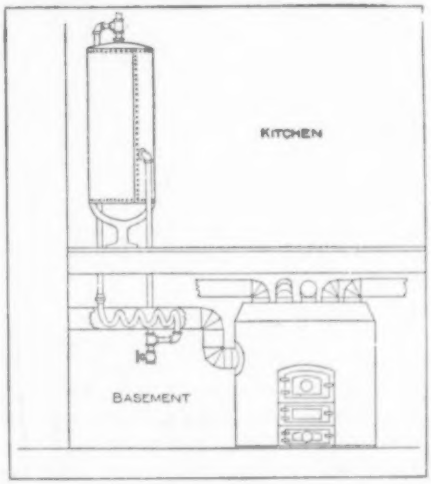
The transmission of power with the use of steel bands has proven practicable after a number of tests. A much narrower belt can be used, one-sixth of the width of the usual leather band being sufficient. The steel band is not so heavy as the usual leather band, and, as it can be very tightly adjusted, the distance between the engine and the machine is not a matter of importance, as in the case with the leather belting, where the transmission of power is dependent upon the weight of the hanging belt. The slipping is much reduced and experiments show that this does not exceed one-tenth of one per cent. Owing to the lightness of the steel belting, the influence of the centrifugal force is not so great and allows of a much increased velocity.

Utilizing Waste Heat in a Furnace Flue

Last winter an auxiliary hot water heater in conjunction with a hot air furnace was put in operation in a residence which demonstrated that the efficiency of the old type of house heating furnace could be materially increased, and the coal bill thereby reduced. As the latter seems to be the chief object of the maker, a description of the plan may not come amiss for many that own furnaces.

This heater not only gives something for nothing by using a waste product, but makes possible the warming up of exposed rooms, halls, etc. Also, when gas stoves are used for cooking, and have no water back, connections can be made to the house service boiler, furnishing an ample supply of hot water at all times.

The sketch shows the device installed for use in connection with a range boiler. A $\frac{3}{4}$-in. brass pipe (which is easily bent) is coiled and placed in the smoke flue of the furnace and connected to the water supply and the radiators or hot water boiler, or both. In this



Connected with a Range Boiler

case it is used for hot water supply only, as a gas range is used for cooking.

The smoke pipe is short and only 7 in. in diameter and the coil takes up a large part of its cross sectional area. As the draft is strong this loss of area does not prevent satisfactory operation.

When the furnace is started in the early morning and before new coal is supplied, the outgoing gases in the smoke pipe easily reach 300 to 400 deg. heat. At this time the water in the heating system is at its lowest temperature and can best absorb this waste heat and utilize it.

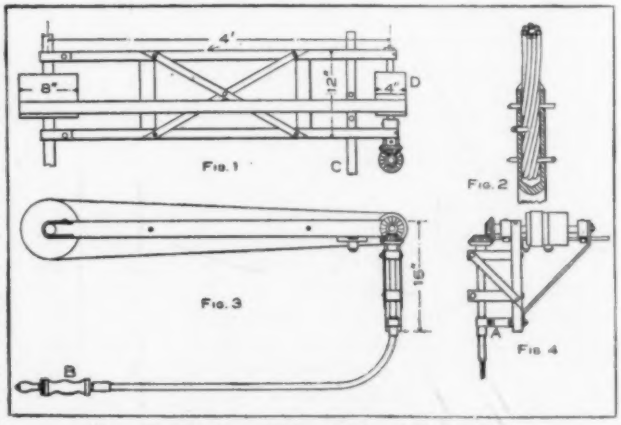
It must be remembered that the coil should be placed between the furnace and the check damper, as the cold air admitted by this damper will decrease the heat absorbing capacity of the coil.

Home-Made Flexible Shaft Boring Machine

The frame of this machine is made of 2 by 1¼-in. well seasoned beech and is fastened together with 3-in. screws. The side pieces are about 4 ft. long and braced in the center of the frame with two pieces of 1-in. band iron. One end of the frame is mounted on the main shaft, while the other is held parallel with the ceiling by means of hooks.

The shafting is ¾ in. and runs in babbitt metal bearings. The gears were taken from an old reaper. A piece of ½-in. steel cable containing seven strands of nineteen wires each was used for the flexible shaft. The method of fastening the ends is shown in Fig. 2. A ½-in. hole was drilled 3 in. deep into the end of the gear shaft and one end of the cable put into it and held with three pins. When using wire nails for pins they can be driven through the cable without drilling which will expand the end of the cable and make it fit the hole tightly. Holes must be drilled through the shaft to take the pins. The pins are then cut off outside the shaft and smoothed down level.

The cable was covered with a piece of ½-in. rubber hose and fastened with a clip, A, Fig. 4, to keep it from turning. The handle, B, Fig. 3, is made of wood, and each end is fitted with bearings taken from the crank hanger of an old bicycle. A piece of ¾-in. shafting runs through the handle, B, and the other end of the cable is fastened into this in the same manner as shown in Fig. 2. A chuck taken from an old brace was fastened to the other end of the shaft in the handle. The slide, C as shown in Fig. 1, is used to shift the belt to the loose pulley, D, when the machine is not in use. The device may be used on either side of the main shaft by unhooking and swinging the frame under the shaft.



May Be Used on Either Side of Main Shaft

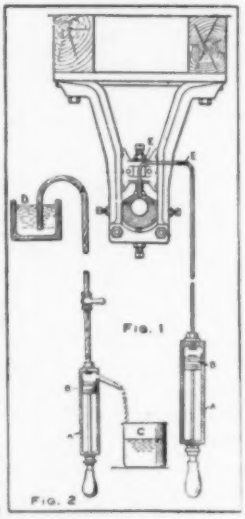
Grounding Fence Wires

Two-thirds of the heavy loss of stock caused by lightning comes from the wire fence. The remedy for this is easily applied and may be done on a wet day or at a time when other work is not pressing. Cut galvanized No. 12 wire in 8-ft. lengths. Place one of these wires on a post about every 64 ft. apart and staple good and solid to every fence wire and the post. The

upper end of the wire should project a little above the post, while the lower end should extend into the ground about 3 ft. A hole may be made for grounding this wire by using an end-gate rod and pushing it into the ground.

Oiler for Overhead Bearings

The accompanying sketch shows a device for oiling overhead bearings. It consists of a cylinder, A, Fig. 1, about 2½ in. inside diameter and 12 in. long, provided with a piston, B. To the opposite end of the cylinder is connected a small pipe with its end bent in the form of a hook, EE. To operate, the piston is pushed to the end of the stroke, the bent pipe is immersed in a vessel of oil and the piston is drawn back, drawing the oil into the cylinder. The end of the pipe can then be inserted in the oil hole of the bearing, the piston pushed up and the oil forced out onto the shaft.

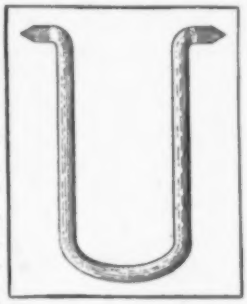


Where drip pans are used, the oil may be drawn from them by this same device, says a correspondent of Power. The oil is drawn from the drip pan D, Fig. 2, in the same manner as filling the oiler, with the exception that the oil runs out as through a siphon after the first suction of the piston B, running through a side outlet into a receiving tank, C.

A new vitrified protector is used for anchor bolts to prevent destruction of the enclosed bolts by electrolysis, and also prevents the escape of electricity through columns to bolts and thence to water mains, etc.

Cleaning the Threads of a Chuck or Face Plate

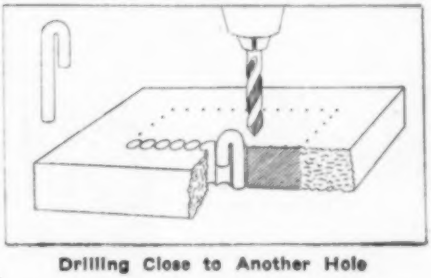
The accompanying sketch shows a handy tool for cleaning the chips and dirt from the threads of a chuck or face plate of a lathe or milling machine before turning them on the spindle. The tool can also be used for cleaning nuts or any internal thread.



This tool, as illustrated, is U-shaped, being made from ¼-in. steel rod with ends or points flattened and ground the shape of a thread with 60-deg. angle. The points are then case-hardened. The tool will spring to suit different sizes if the length is about 4 in.—Contributed by George Long, New York City.

How to Drill Holes Close Together

The accompanying sketch shows a simple device for drilling holes close together. Take a piece of steel wire the same size as the drill and bend one end over, as shown. Lay out the work and drill two holes to make a start. Put the long end of the wire in the last hole and the short end in the next one to it, says a correspondent of American Machinist. Allow the drill to follow down beside the wire pin, and when the holes are all drilled you will have them all connected and the piece drops out without any trouble or broken

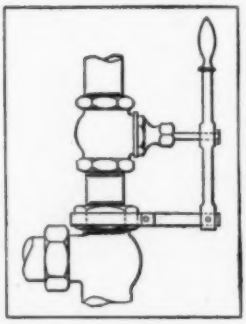


Drilling Close to Another Hole

drills. This will be of special interest to die makers.

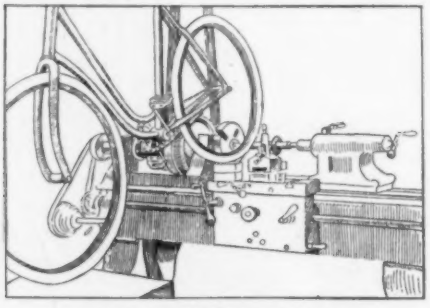
Utilizing a Worn Valve

The threads on the valve stem of a globe valve used with an injector became worn and the valve was made to do service in the following manner: The threads were filed smooth with the rest of the stem and a lever fitted to the stem as shown in the sketch. All that was necessary to operate the valve, says Power, was to pull the handle.



A Kink on Jointing Slotting Cutters

In a small job shop we use a good many slotting saws in a common lathe for different kinds of work. Not having any cutter grinder the saws were placed on an arbor and the arbor put in the centers of a lathe which were set loosely so the arbor would turn quite freely. The rear wheel of a bicycle is then placed on the arbor as shown in the illustration. When the bicycle wheel is turned by the cranks the arbor will spin very fast. While turning, the tool post, with a piece of emery whetstone previously clamped in, is fed up to the cutter and all the teeth joined the same length. After the saw has been jointed it can be taken to a common emery grinder and, with a little care, be ground up in good shape.—Contributed by Harry C. Foster, Connersville, Ind.

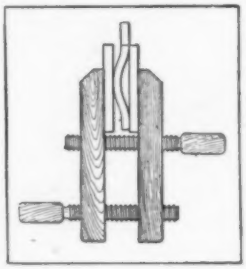


Jointing Slotting Cutters

The average velocity of chimney gases is 600 ft. per minute.

Storage Battery Troubles and Their Remedies

Sulphating is caused by overdischarging a battery and allowing it to stand in that condition, or letting the battery stand without being overdischarged, but with the electrolyte too strong. The remedy is to remove by scraping the plates and then charging at a low voltage for a long period, says Practical Engineer. In this way, by fully charging and only partially discharging, the sulphating is eliminated. Sulphating can also be removed by adding a small quantity of sodium sulphate, which decomposes and dissolves the sulphate.



Buckling is caused by an unequal expansion of the plates, which is due to the sulphate lodging on the plates, thus preventing action from taking place at that point and by excessive charging. If the plates are not badly buckled they can be placed between two boards and with a little pressure applied, as shown in the sketch, they can be straightened out.

Disintegration is caused by sulphating and buckling, which forms scale on the plates, thus reducing the capacity of the cell. The positive plate suffers from this disease more than the negative, and as the positive plates are expensive the operator must be very careful to prevent this action. To avoid disintegration, do not allow the battery plates to

become sulphated or buckled, and attend to all trouble at once.

Short circuits are caused by sediment forming at the bottom of the cell. Raise the plates and place them on glass or wood separators; in small cells the clearance is generally 1 in. and in large cells about 6 in.

Improving the Compression of a Gasoline Engine

When the piston rings and the walls of the cylinder become worn, open the crank case and sprinkle about one tablespoonful of flake graphite in the front end of the cylinder. Repeat this application once every two weeks and you will find that the graphite will fill in the low or worn places, which will bring the compression up to normal again.—Contributed by W. O. Hay, Camden, S. C.

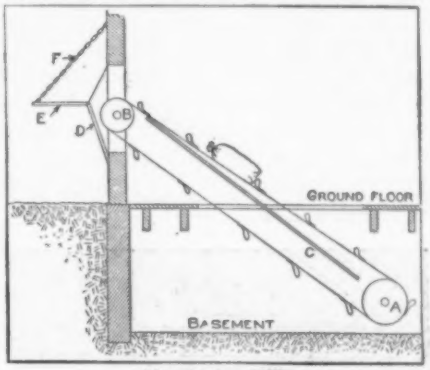
Sack Carrier and Loader

A cheap and easily constructed sack carrier and loader for carrying screenings and other stuff out of the basement of a mill to the ground floor and for loading sacks on the delivery wagon can be made from an old belt and a few pulleys.

The drive pulley, A, is on the shaft of a jack and is thrown in gear by pulling a rope hung in the most convenient place on the ground floor. This rope is attached to a lever in the basement that straddles the shaft on which pulley, A, is attached and bears against a collar on the shaft. A spring placed between the bearing and a collar on the end of the shaft is used for the release. When the rope is slackened the spring pulls the shaft out of gear. In this manner the sack loader is thrown in or out of gear instantly.

The driven pulley, or the return for the belt, is shown at B. If a wide belt is used and there is no wide pulley of small diameter at hand, use two small pulleys together.

The lugs are made by attaching to the belt pieces 8 or 10 in. long cut from an old 6-in. belt and doubled, allowing them to roll up. They are fastened by



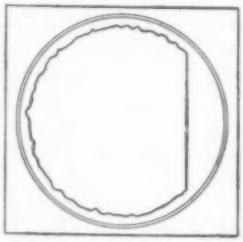
Handy for Mills

means of elevator bolts with the nuts on the top side. The roll will fall back over the nuts and prevent them from tearing or touching the sacks. A hardwood board, C, is placed in such a manner that the upper end is nearly flush with the face of the pulley, B, and the lower end points to the center of pulley A. This will allow the weight of the bags to act as a tightener on the belt by sagging it down, says American Miller. This takes up any slack in the belt and prevents slipping.

A hopper, D, is built on the outside of the building; the lid of the hopper, E, is thrown down and held by chains, F. The lid of the hopper, E, forms the top when closed.

A Kink for the Painter

When using mixed paints that come put up in round pails, cut the thin cover in the shape shown in the sketch. The straight edge thus formed will make a place to remove the surplus paint from the brush, also will prevent the paint from running down the outside of the can.—Contributed by Clare A. Poland, Atchison, Kans.

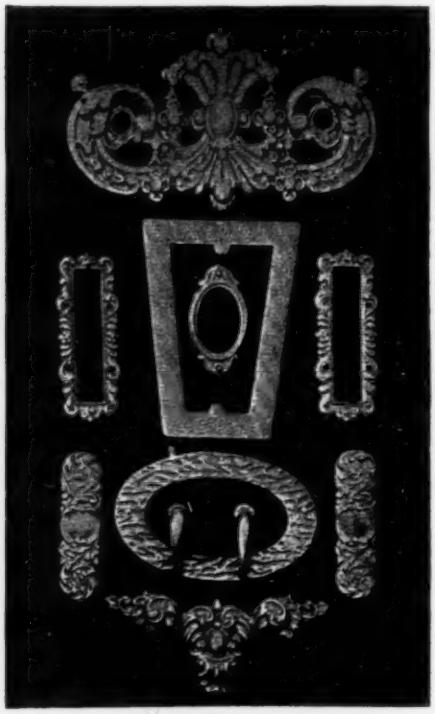


How to Produce Gold Color on Brass

Condensed Article From the Brass World

A gold color may be obtained upon small brass articles by a simple dip that is used so frequently for imparting a steel blue color to brass or other metal goods. The dip is made as follows:

Water .....1 gal.
Sugar of Lead (Acetate of Lead).....4 oz.
Hyposulphite of Soda (Hypo).....4 oz.



Improved by Dipping

The sugar of lead is dissolved in the water previously heated nearly to boiling, and then the hyposulphite of soda is added. The solution turns a milky color from the precipitated hyposulphite of lead, but it should not be filtered out.

In order to get the best results the solution should be heated to a temperature of about 200 deg. F., or just short of boiling. It deteriorates very rapidly when actually boiled and turns black. When immediately made, the white precipitate in the solution is fine and adheres to the articles being colored, but after heating for five or ten minutes, it collects in clots and settles to the bottom. It is then that the best results are obtained in coloring brass. After some time the solution does not work as rapidly and finally a new one must be made. A large quantity of work can be passed through, however, without deteriorating it, as the color is a mere film.

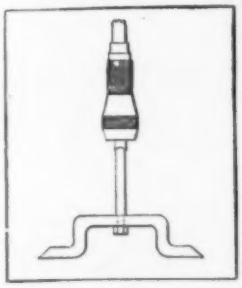
The brass to be colored should be cleaned in the usual manner and may be polished or dipped. It makes no difference about the result. The articles are immersed in the hot solution (nearly boiling) and carefully watched. It takes a few seconds for the first shade of color to appear and it is then very light. Soon a darker yellow forms and then a brownish-gold shade is produced. The articles are removed as soon as the desired color is reached and should not under any circumstances be allowed to remain, as the shade rapidly darkens until the surface becomes purple. As the different tints form slowly it is not a difficult operation to obtain the desired color. By allowing the articles to remain in the solution for a longer time, a purple, blue and finally steel-black color can be produced.

When the desired shade has been obtained on the articles they should at once be removed, rinsed in cold water, then in hot water and dried in sawdust. They are then lacquered. The lacquering is quite necessary, as the gold-colored film on the surface of the metal will fade in time if not thus protected.

The colors that are produced in this manner are not so rich as the gold, to be sure, but answer the purpose on cheap work. The brownish shade, which appears just before the purple color begins to form, is quite rich and is very pleasing. The general application of this solution has been for the production of the blue color to imitate blued steel, and for such a purpose it is only necessary to allow the articles to remain in the solution for a longer time.

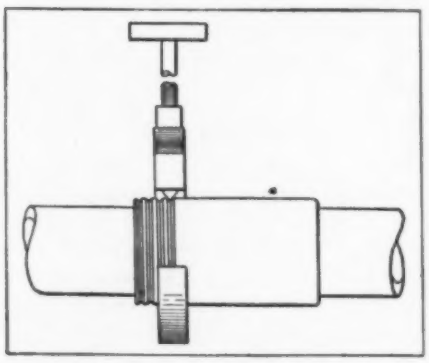
How to Make an Old Gasket Cutter

A device for removing such old gaskets as may stick to the water leg of a water tube boiler is shown in the accompanying sketch. The cutter can be made from a piece of steel or an old file, says Power. The steel is bent as shown and made as long as the diameter of the hole in the water leg. One will be surprised at the good work this device will do when used with a bitstock.



How to Repair a Leaking Pipe Coupling

To avoid the expense for coupling or other material and to save time, which is always limited when pressure is on a leaky pipe, the following method has been used in a number of cases and has held permanently, says a correspondent of Practical Engineer. The coupling is swaged on the pipe about the threads, which is done with an ordinary pipe cutter of the hand-power type. The cutter should be placed as near the end of the coupling as will work



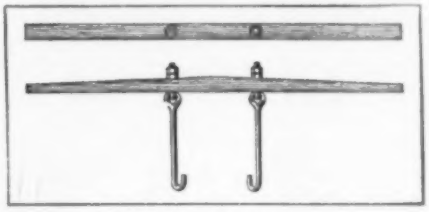
Saves Time and Expense

satisfactorily and operated the same as in cutting pipe until the cutter has run to a depth of perhaps $\frac{1}{16}$ in. About three or four different positions as near each other as possible will generally crimp or swage the coupling to a tight fitting joint.

The objection to this method is generally advanced that it weakens the joint by cutting the coupling, but when the amount of metal still left is compared with that left in the pipe at the base of the thread the danger as will be seen is slight.

How to Make a Jack Carrier

In many shops jacks are used quite frequently, and to truck them over rails and around blockings is in many instances quite impossible. A jack carrier constructed as shown in the sketch makes it quite convenient for two persons to carry a jack to the place desired.



Handy Jack Carrier

The carrier consists of a piece of wood $2\frac{1}{2}$ in. wide and $2\frac{1}{4}$ in. thick in the middle and tapering toward the ends, making them $1\frac{1}{4}$ in. thick. Two hooks are made from $\frac{1}{2}$-in. round iron and fitted with an eye on their upper ends. These hooks should be 12 in. long after the hook and eye is formed. Each hook is attached to the wood handle with an eye bolt as shown. The holes for the eye bolts should be bored through the wood handle each at an equal distance from the center to make them $12\frac{1}{2}$ in. apart.

The Use of Gasoline

Keep a glass-stoppered bottle full of gasoline for use in cleaning and sterilizing instruments, as it will absolutely destroy any animal immersed in it from a microbe to an elephant, says a corre-

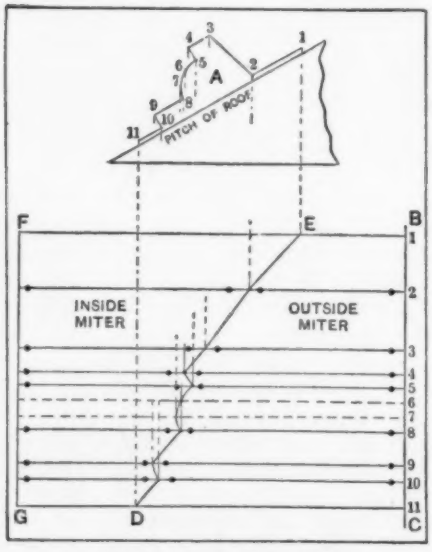
spondent of the Pacific Dental Gazette. By the use of gasoline steel instruments may be kept bright and free from rust. Gasoline is cheap, ready for instant use at all times, and gives one a sense of security in its use that is a constant source of joy.

When operating in particularly unsavory months, never let an instrument touch the bracket until it is dipped in gasoline and polished with a dry towel.

Gasoline will clean your oil stones, wash basin, machinery, linoleum, woodwork, light your office, do your furnace and blowpipe work, vulcanize, cook your meals and carry you to and from your office in a trice.

How to Draw a Miter for Gutter Molding

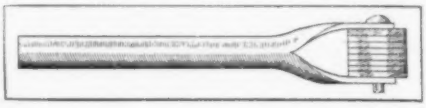
The accompanying sketch shows a method of drawing an inside and outside miter for a gutter molding without the use of a plan. Let A represent the profile of the gutter mold, placed upon the proper pitch of the roof, as shown. Divide the mold A into equal spaces, says the Metal Worker, and place its girth upon the vertical line BC, through which horizontal lines are drawn and intersected by vertical lines dropped from similar numbered points in the mold A. A line traced through points thus obtained, as shown by DE, will be the miter cut, and EBCD will be the outside miter cut and EDGF the inside miter cut.



Method of Drawing Miter

Home-Made Grindstone Dresser

Procure a piece of ½-in. gas pipe about 2 ft. long and split one end down about 4 in. Bend the sides out in the



shape of a fork and drill a ¼-in. hole through the ends, which are flattened. Use a ¼-in. bolt for a pin and put enough washers on the pin between the forks to loosely fill the space. By holding the washers diagonal with the surface of the stone and reversing them occasionally, a stone of any kind can be dressed in a few minutes. By letting the washers roll parallel with the stone they will finish the surface smooth.

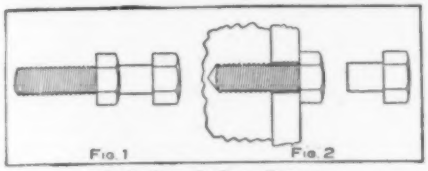
How to Prevent Rust on Automobile Rims

If the wheel rim is painted with a mixture of shellac and finely pulverized flake graphite, mixed to a stiff paste, rust on wheel rims with its attendant bad effects upon tires may be largely eliminated or entirely eradicated, says Motor Age. After treating the rims as indicated above, it will be found that they are very even and a waterproof film of great smoothness is formed. The graphite is absolutely inert and there need be no apprehension regarding the detrimental effect on the rubber. If the whole inner shoe is painted with a mixture of graphite and shellac, there will be little tendency for the tube to stick.

Tar coated water pipes must be covered with shellac before being painted, else they will show tar stains.

Substitute Cap Screw

When a cap screw is needed for repairs in small shops one is cut from stock, or a stud bolt is used with a nut. An ordinary carriage or machine bolt

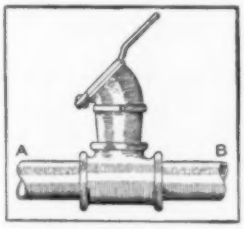


Details of Cap Screw

may be used by turning the nut on backwards and jamming it as far back as possible, as shown in Fig. 1. Screw the bolt in place by turning with the bolt head and then saw the remaining part off flush with the nut as shown in Fig. 2. This will make a neat and lasting job as the nut cannot work loose. —Contributed by W. O. Hay, Camden, South Carolina.

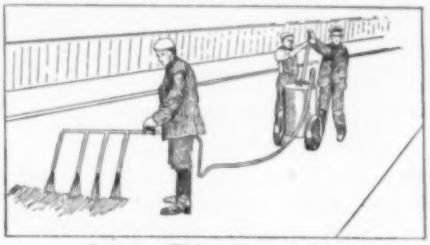
A Cut-Out for Under Water Exhaust

In order to do away with the noise from my boat engine I fitted an under water exhaust. The direct piping from the cylinder to the water was not entirely satisfactory at first, as the water, which backed up into the exhaust pipe when the engine was not running, caused a back pressure that rendered the starting of the engine impossible until the pressure was released. This made considerable cranking necessary before it was safe to cut in the switch. To remedy this it was necessary to have some arrangement so that the exhaust could be turned into the open air when starting the engine and return it under water after sufficient speed had been attained. When looking around the shop for something suitable to make a valve cut-out I found an old molasses gate. This was attached in a tee, as shown in the sketch. The exhaust pipe going under water is shown at A and that from the engine at B. No boat on the lake runs as quietly as this one supplied with this arrangement.—Contributed by E. W. Ripley, Brandon, Vt.



Laying Tar with a Giant Air Brush

When roads are tarred they are free from dust, but this makes it unpleasant for the motorist when the tar is wet. The accompanying illustration shows a giant air brush in operation which lays the liquid tar on the surface very even. This makes a thin coat of tar that dries


Lays a Thin Coat of Tar

quickly and the usual uneven and thick places on which the wheel of a car may slide do not occur.

Pounding Prevented in Steam Pipes on Railroads

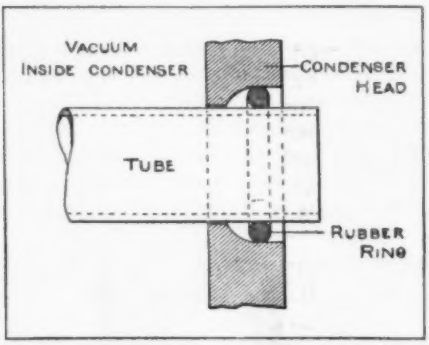
The annoying noise from pounding of steam pipes can be easily overcome by attaching a ¼-in. check valve to the pipe or radiator, setting it so that air will be admitted to the pipes but not to release any pressure. Either horizontal or vertical check valves may be used.

A vacuum in the pipes is caused by turning hot steam into cold pipes, and the result is condensation and the water-hammer or pounding. The check valve relieves this by admitting air. When once installed the device works automatically and does not require any attention.—Contributed by Frank Will, Oakland, Calif.

A horizontal engine will require more oil than a vertical one of the same size.

A Method of Packing Condenser Tubes

The customary method of expanding tubes in the condenser heads always means delay in the renewal of defective tubes. A much simpler plan is the application of rubber rings into conical recessed holes in the heads for getting



Rubber Insulation Saves Trouble

tight joints, as shown in the accompanying sketch. This joint also allows a free expansion of the tube, says Practical Engineer, and the rubber insulation interrupts all the destructive galvanic currents usually giving rise to many of the troubles with condenser tubes.

Further, as without exception surface condensers require a thorough cleaning of the cooling surface, inside as well as outside the tube, it is a comparatively easy operation to remove and insert tubes with this style of packing.

Care of Large Bearings

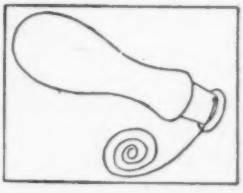
When babbitt attains a certain degree of heat it expands very quickly, and the first thing to do is to slack up on the cap-bolts (and quarter-boxes, if there are any); but if it is a very large box, it is not sufficient to slack up on the cap-bolts, as the weight of the cap still bears on the shaft and will cause considerable friction and prevent the cooling of the shaft. Some large boxes are provided with screws for the purpose of raising the cap, but if not, a small wedge made of 1- by ½-in. flat iron, about 2 in. long, must be driven under the cap on both sides. Then apply a liberal supply of good cylinder-oil that will stand high temperature before it will burn, says a correspondent of Power. What the babbitt needs is room to expand in, and plenty of good lubrication that will prevent it from becoming worse and gradually cool it. If the bearing has been lubricated with grease, do not use oil. Slack up as before and apply more grease.

After the box has been very hot the cap should be removed at the earliest opportunity and all the oil grooves cleaned out, or else it will give trouble soon again. Never molest a box that is running all right, just to see if the grooves are in good order, as the chances are it will heat up the next day.

Run all the oil out of the cups just before shutting down on Saturday and fill them with kerosene, allowing it to run down through the bearing and wash out all grit that may have accumulated. The best oil is none too good for a bearing. While filtered oil is used many times, it is usually only half filtered and the bearings suffer in consequence. While it may keep them running cool, it cannot preserve them as well as if new oil were used.

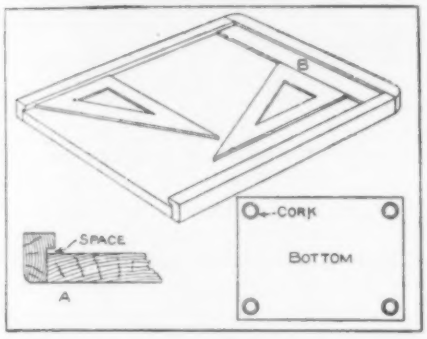
Ferrule for a Wood Handle

The accompanying sketch shows how to make a small size ferrule for wood handles. The handle is turned with a small rim on the end and a flat surface adjacent to the rim. A small hole is made in the flat surface in which to insert the end of a wire. Broom wire may be used for making the ferrule. One end of the wire is inserted in the small hole to hold it while wrapping the flat surface full of coils. When full, solder the coils together and a ferrule will be had that fits the wood tightly.



How to Make a Field Sketching Board

Cut a piece of $\frac{3}{8}$-in. straight grained pine board $10\frac{1}{8}$ by $15\frac{1}{8}$ in. and make it perfectly square. Fasten a piece of pine on two sides and one end of the board as shown in the sketch. This piece of pine is rabbeted a trifle wider than the



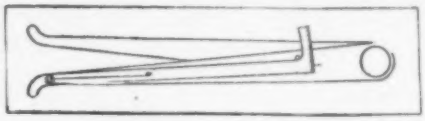
Field Sketching Board

board is thick, as shown in the end view at A, allowing a small space between the board and the rabbet edge. Both outside and inside edges of this strip must be made straight for the T-square and triangle.

If the board is to be used for patent office drawings, it will be found handy to have a piece of old T-square, B, fitted into the closed end of the board. The space on the drawing paper under this piece of T-square is the space reserved for patent office drawing sheets. Four corks or pieces of felt are fitted to the bottom of the board as shown. Paper clips may be used to hold the piece of T-square, B, and the drawing paper. The paper or bristol board is slipped into the space left between the board and the edge of the rabbet and held in place with thumb tacks.

An Attachment for Inside Calipers

Many times in difficult places it is impossible to find the largest diameter of a hole with common inside calipers. The device shown in the sketch is simple, accurate and easily constructed for use in finding the largest diameters of holes. The foot is cut from one side of an ordinary inside caliper and the



For Finding Diameters of Holes

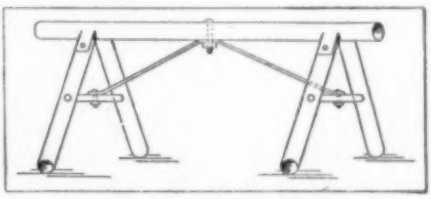
graduated arm with a foot, as shown, is pivoted in its place. A very light spring is soldered to the head of the rivet or screw and its extending length pressing against a pin located on the arm keeps the arm at zero on the scale. The graduations mean nothing more than marks to note the position of the arm while making the measurement.

The main object of this device is that the spring will cause the attached arm to find the largest diameter of the hole and will not measure to one side.

The graduations may be made to suit the operator. A test indicator could be clamped to one leg of the caliper with the same result.

How to Make a Gas Pipe Trestle

Procure a piece of pipe about 5 ft. long and $1\frac{1}{2}$ in. in diameter and saw two cuts across the seam of the pipe about 6 in. from each end, using a hack saw to do the work, says the American Blacksmith. The cuts should be about three-quarters of the way through the pipe and $1\frac{1}{4}$ in. apart. The pipe is now



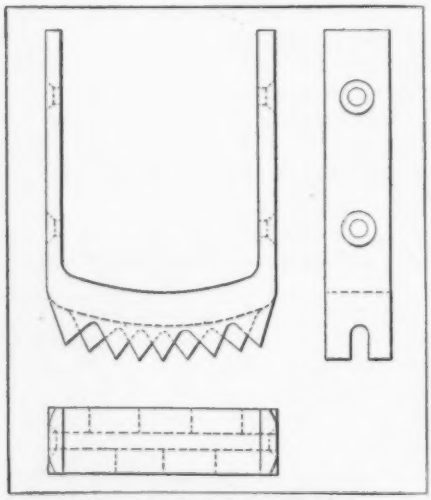
Made of Gas Pipe

opened between these cuts at the seam and the two lips bent back in the same angle at which the legs are to stand. Secure four pieces of $1\frac{1}{4}$-in. pipe $2\frac{1}{2}$ ft. long for the legs. Drill a small hole in one end of each piece and rivet them to

the lips of the other pipe with rivets to fit the holes drilled. A cross piece made from 1-in. pipe is fastened to each pair of legs at a point about half way and a brace fastened with each end to the middle of each cross piece with rivets, as shown. This brace is also bolted to the middle and under side of the top pipe.

How to Prevent Ladders from Slipping

The bottom of machine shop ladders often slip on the wooden floor on account of so much grease. A correspondent of the American Machinist devised a foot as shown in the illustration which has been quite successful. It is



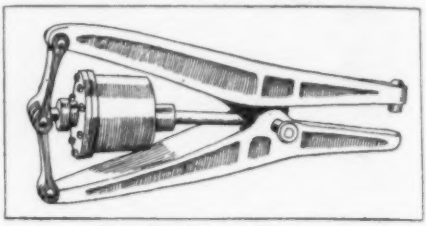
Keeps Ladder from Slipping

made from malleable iron and is inexpensive. The one shown is for a ladder 3 in. wide at the foot and has 10 staggered teeth on the bottom about ¾-in. centers. It is fastened to the ladder with ordinary wood screws, and adds almost nothing to the weight.

Spilled mercury may be collected by rolling a piece of tin foil tightly to the size of the lead in a pencil and touching the end to the scattered globules. When as much mercury is gathered as the tin foil will hold, squeeze the amount collected into a suitable receptacle.

How to Make a Pneumatic Riveter

The accompanying sketch shows the construction of a riveter using an old steam cylinder for the power. Two large and heavy castings are made with



Construction of Riveter

a hinge joint about two-thirds the length of the arms and connected on the long ends with a toggle joint. When steam or compressed air is applied to the cylinder the piston pulls the toggle joint almost straight, which causes the riveting end of the arms to close on the heated rivet.

Handy Soldering Acid Bottle

Procure a low and wide bottle, a common glass alcohol lamp such as jewelers use is the best, and fit into the neck a hard rubber bushing. Cut a hole in the bushing to a size that will accommodate a common medicine dropper or fountain pen filler. Supply the bottle with a dropper or filler, as shown, and you will have an ideal acid bottle. The hole in the bushing should be cut out larger in the top similar to a funnel.—J. E. Ganaway.

Old tape may be made "sticky" by applying a little heat.

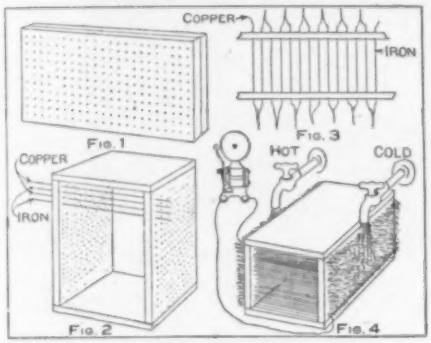
A soft carbon brush that sparks may sometimes be cured by raising it to a red heat and then plunging into a bath of ordinary lubricating oil.

Amateur Mechanics

How to Make a Thermo-Electric Battery

By Arthur E. Joerin

A novel way of producing an electric current by means of hot and cold water, heat from a match or alcohol lamp, is obtained from a device constructed as shown in the sketch. Take two hardwood boards, marble or slate plates about 8 by 10 in. and place them together, as shown in Fig. 1, mark and drill about 500 holes. These two pieces should be separated about 8 in. and fastened with boards across the ends, as shown in Fig. 2.



Details of Battery

Take soft copper wire, not smaller than No. 18, and cut in lengths to pass through the holes in the two boards and have sufficient end to make a tie. This will require about 70 ft. of wire to fill one-half the number of holes. Also, cut the same number of lengths from the same sized galvanized iron wire to fill the remaining holes. The wires are put through the holes in the boards alternately, that is: begin with copper, the next hole with iron, the next copper, and the next iron, and so on, twisting the ends together as shown in Fig. 3. The connections when complete should be copper for the first and iron for the last wire.

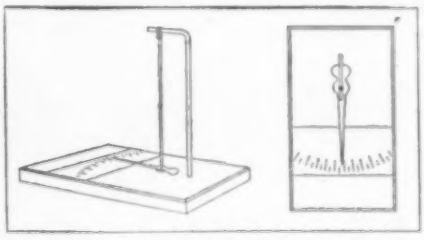
When the whole apparatus is thus strung the connections, which must be twisted, can be soldered. Connect one copper wire to the bell and the other terminal, which must be an iron wire, to the other post of the bell. The apparatus is then short-circuited, yet there is no current in the instrument until a lighted match, or, better still, the flame from an alcohol lamp is placed at one end only.

Best results have been obtained by putting ice or cold water on one side and a flame on the other. The experiment did well to place the whole apparatus under sink faucets with the hot water turned on one side and the cold water on the other. The greater the difference of temperature in the two terminals, the more current will be obtained.

Very interesting experiments may thus be performed and these may lead to the solving of the great thermo-electric problem.

How to Make a Hygrometer

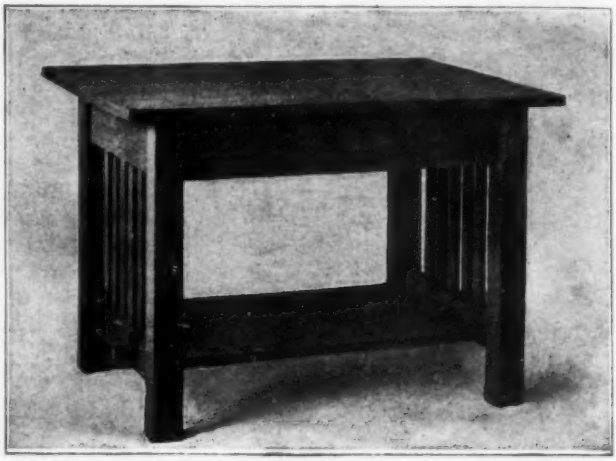
Mount a wire on a board, which is used for a base and which should be ⅜ by 4 by 8 in., as shown in the sketch. A piece of catgut—a string used on a violin will do—is suspended from the bent end of the wire. A hand or pointer is cut from a piece of tin and secured to the catgut string about ½ in. from the base. A small piece of wood and some glue will fasten the pointer to the string. The scale is marked on a piece of cardboard, which is fastened to the base and protected with a piece of glass. —Contributed by J. Thos. Rhamstine.


Simple Hygrometer

How to Make a Mission Library Table

The mission library table, the drawings for which are here given, has been found well proportioned and of pleasing appearance. It can be made of any of the several furniture woods in common use, such as selected, quarter-sawed white oak which will be found exceptionally pleasing in the effect produced.

If a planing mill is at hand the stock can be ordered in such a way as to avoid the hard work of planing and sandpapering. Of course if mill-planed stock cannot be had, the following dimensions must be enlarged slightly to allow for "squaring up the rough."



This Picture is from a Photograph of the Mission Table Described in This Article

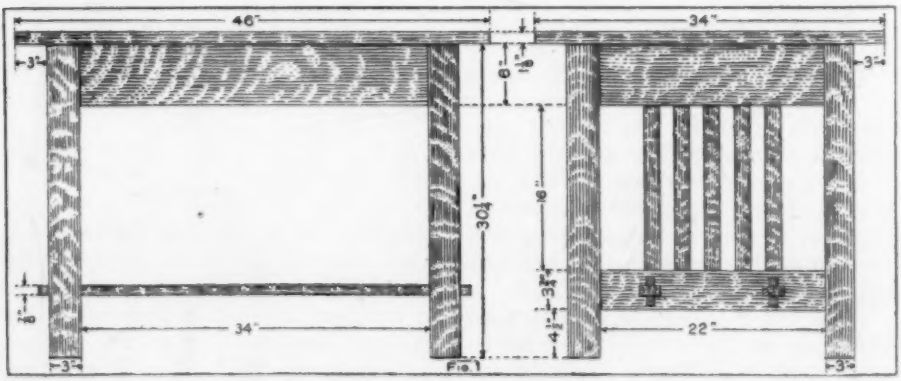
For the top, order 1 piece 1¼ in. thick, 34 in. wide and 46 in. long. Have it S-4-S (surface on four sides) and "squared" to length. Also, specify that it be sandpapered on the top surface, the edges and ends.

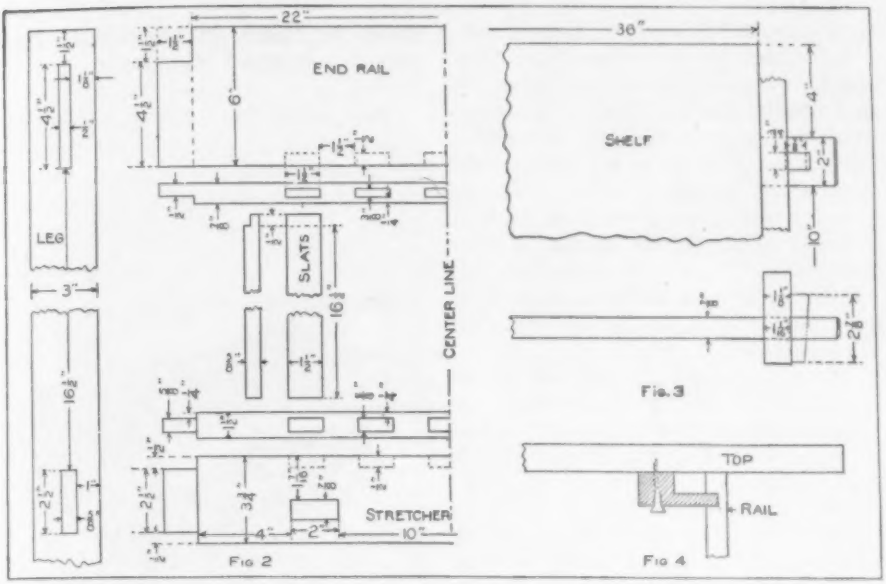
For the shelf, order 1 piece ⅞ in. thick, 22 in. wide and 42 in. long, with the four sides surfaced, squared and sandpapered the same as for the top.

For the side rails, order 2 pieces ⅞ in. thick, 6 in. wide and 37 in. long, S-4-S and sanded on one side. For the end rails, 2 pieces ⅞ in. thick, 6 in. wide and 25 in. long. Other specifications as for the side rails.

For the stretchers, into which the shelf tenons enter, 2 pieces 1⅛ in. thick, 3¾ in. wide and 25 in. long, surfaced and sanded on four sides. For the slats, 10 pieces ⅝ in. thick, 1½ in. wide and 17 in. long, surfaced and sanded on four sides. For the keys, 4 pieces ¾ in. thick, 1¼ in. wide and 2⅞ in. long, S-4-S. This width is a little wide; it will allow the key to be shaped as desired.

The drawings obviate any necessity for going into detail in the descrip-





tion. Fig. 1 gives an assembly drawing showing the relation of the parts. Fig. 2 gives the detail of an end. The tenons for the side rails are laid off and the mortises placed in the post as are those on the end. Care must be taken, however, not to cut any mortises on the post, below, as was done in cutting the stretcher mortises on the ends of the table. A good plan is to set the posts upright in the positions they are to occupy relative to one another and mark with pencil the approximate positions of the mortises. The legs can then be laid flat and the mortises accurately marked out with a fair degree of assurance that they will not be cut where they are not wanted and that the legs shall "pair" properly when effort is made to assemble the parts of the table.

The table ends should be glued up first and the glue allowed to harden, after which the tenons of the shelf may be inserted and the side rails placed.

There is a reason for the shape, size and location of each tenon or mortise. For illustration, the shape of the tenon on the top rails permits the surface of the rail to extend almost flush with the surface of the post at the same time permitting the mortise in the post to be kept away from that surface. Again, the shape of the ends of the slats is such that, though they may vary slightly in length, the fitting of the joints will not be affected. Care must be taken in cutting the mortises to keep their sides clean and sharp and to size.

In making the mortises for the keyed tenons, the length of mortise must be slightly in excess of the width of the tenon—about $\frac{1}{8}$ in. of play to each side of each tenon. With a shelf of the width specified for this table, if such allowance is not made so that the tenons may move sideways, the shrinkage would split the shelf.

In cutting across the ends of the shelf, between the tenons, leave a hole in the waste so that the turning saw or compass saw can be inserted. Saw within one-sixteenth of the line, after which this margin may be removed with chisel and mallet.

In Fig. 3 is shown two views of the keyed tenon and the key. The mortise for the key is to be placed in the middle of the tenon. It will be noted that this mortise is laid out $1\frac{1}{16}$ in. from the shoulder of the tenon while the stretcher is $1\frac{1}{2}$ in. thick. This is to insure the key's pulling the shelf

tightly against the side of the stretcher.

Keys may be made in a variety of shapes. The one shown is simple and structurally good. Whatever shape is used, the important thing to keep in mind is that the size of the key and the slant of its forward surface where it passes through the tenon must be kept the same as the mortise made for it in the tenon.

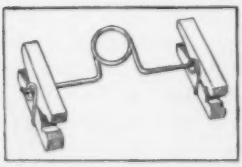
The top is to be fastened to the rails by means either of wooden buttons, Fig. 4, or small angle irons.

There are a bewildering number of mission finishes upon the market. A very satisfactory one is obtained by applying a coat of brown Flemish water stain, diluted by the addition of water in the proportion of 2 parts water to 1 part stain. When this has dried, sand with number 00 paper, being careful not to "cut through." Next, apply a coat of dark brown filler; the directions for doing this will be found upon the can in which the filler is bought. One coat usually suffices. However, if an especially smooth surface is desired a second coat may be applied in a similar manner.

After the filler has hardened, a very thin coat of shellac is to be put on. When this has dried it should be sanded lightly and then one or two coats of wax should be properly applied and polished. Directions for waxing are upon the cans in which the wax is bought. A beautiful dull gloss so much sought by finishers of modern furniture will be the result of carefully following these directions.

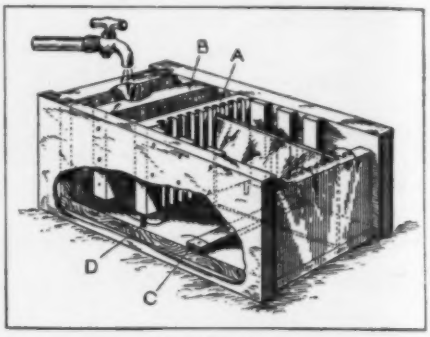
A Hanger for Trousers

Secure two clothes pins of the metal spring kind for the clamps of the hanger. The pins are fastened one to each end of a looped galvanized wire. This wire should be about 6 in. long after a coil is bent in the center as shown in the sketch. The diameter of the wire should be about $\frac{1}{8}$ in.



How to Make an Adjustable Negative Washer

The sketch herewith shows a washing box for negatives made from an ordinary wooden box. As can be seen, the grooved partition, A, is removable, and as several places are provided for its insertion, the tank can be made to accommodate any one of several sizes of plates, says Camera Craft. The other stationary partition, B, which does not reach quite to the bottom of the tank, is placed immediately next to the end of the tank, leaving a channel between the two for the inflow of the wash water. A narrow, thin strip, C, is fastened to the bottom of the tank to keep the plates slightly raised, at the same time allowing a clearer flow of the water from the bottom upwards to the discharge.



Washing Box

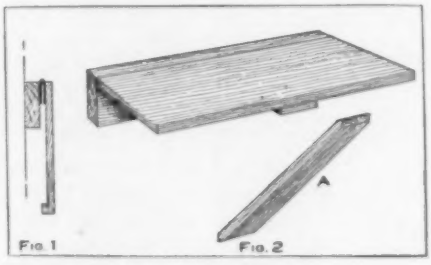
The water enters the narrow partition at the end, flows under the partitions B and A, then upward between and parallel to the surface of the plates, escaping at the opposite end over the top of the tank end, in which the upper part has been cut away for that purpose. The depth of this cut, in the upper part of the tank end, should allow the overflow to be a trifle higher than the width of the largest size plate for which the tank is fitted. Partition B being stationary, can be nailed in position permanently, allowing the bottom edge to clear the bottom of the tank the desired distance. Partition A being movable should have attached to its

bottom edge a couple of nails, D, or better still, wooden pegs, which will keep it also above the bottom of the tank at the desired height.

A coat of paraffin paint should be applied, and, just before it sets perfectly hard, any rough spots trimmed down with a knife or chisel and a second lighter coat applied. If the wood is very dry and porous a preliminary coat of the paint should be applied and allowed to soak into the pores. It is also well to apply a coat of the paint to the joints at the corners and around the edge of the bottom before nailing together.

Turn-Down Shelf for a Small Space

The average amateur photographer does not have very much space in which to do his work. The kitchen is the room used ordinarily for finishing the photographs. In many instances there will not be space enough for any extra tables, and so a temporary place is prepared from boxes or a chair on which to place the trays and chemicals. Should there be space enough on one of the walls a shelf can be made to hang down out of the way when not in use. A shelf constructed on this order may be of any length to suit the space or of such a length for the purpose intended. A heavy piece of wood, about



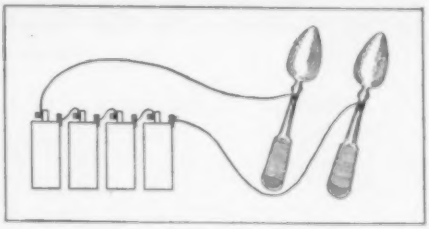
Turn-Down Shelf

1½ in. thick, and 4 to 6 in. wide, is first fastened to the wall at the proper height with nails, or, much better, large screws.

The shelf is cut and planed smooth from a board 12 in. wide and about 1 in. thick. This board is fastened to the piece on the wall with two hinges as shown in Fig. 1. A small cleat is nailed to the outer and under edge of the board and in the middle as shown. This is used to place a support under the outer edge of the shelf. The support, A, Fig. 2, should be long enough to extend diagonally to the floor or top of the baseboard from the inner edge of the cleat when the shelf is up in its proper place.—L. L.

Home-Made Electric Battery Massage

A simple and cheap electric massage device can be made by using three or



Turn-Down Shelf

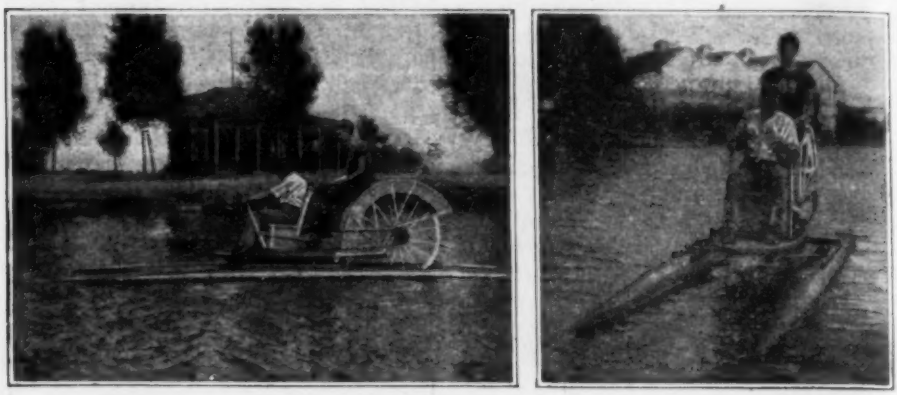
four cells of dry battery connected to two ordinary silver tablespoons, as shown in the sketch. The handles of the spoons should be insulated or the operator can wear either kid or rubber gloves.

How to Make Tint Lantern Slides

Purchase some lantern slide plates and fix them in hypo without exposing, in the usual manner, same as you would an exposed plate, says the Moving Picture World. This leaves a thin, perfectly transparent emulsion film on the glass, which will readily take color. Mix a rather weak solution of clear aniline dye of the desired color and dip the plate in it, wiping the plate side clean. If not dark enough, dip again and again until desired tint is attained, letting it dry between each dipping. A very light blue tint slide will brighten a yellow film considerably, but the tint must be very light, just a bare tint.

A Bicycle Catamaran

The accompanying photographs show a bicycle boat made to carry two persons. This boat is constructed by using two galvanized iron tubes 18 ft. long and 12 in. in diameter, tapered at the front end down to cast-iron points, and the rear end shaped to attach rudders. These tubes are placed 26 in. apart, giving the boat an extreme width of 50 in.



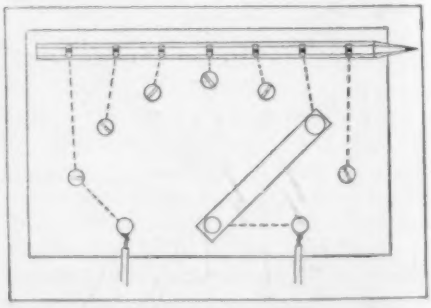
This Catamaran Carries Two People

The cylinders support a platform and on the rear end of this platform is constructed a paddle wheel 52 in. in diameter with 16 spokes. On the end of each spoke is fastened a galvanized sheet metal blade 6 in. wide and 8 in. long. A large guard placed over the paddle wheel forms a seat for one person and a chair in front on the platform provides a place for a second person.

The person in front helps to propel the boat with hand levers which are connected with rods to sprocket wheels on each side of the platform. The occupant of the rear seat contributes his part of the power with his feet on pedals of the shaft that carries the sprocket wheels. This shaft and sprocket wheels drive the paddle wheel by side chains of the bicycle kind. The boat is steered from the rear seat by ropes attached to double rudders. This boat will run at considerable speed and is very steady in rough water as it goes directly through large waves instead of going over them.—Contributed by Ernest Schoedsack, Council Bluffs, Iowa.

How to Make a Lead Pencil Rheostat

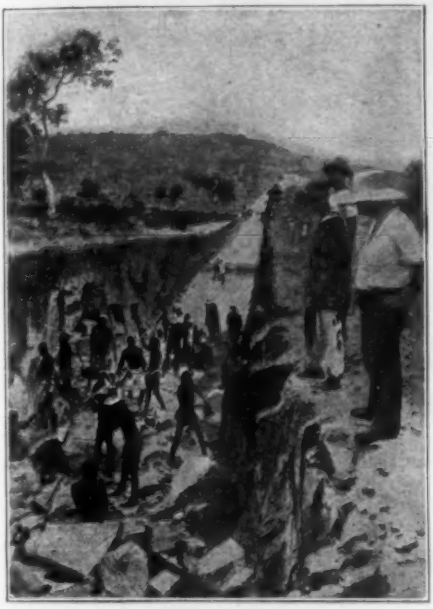
Take an ordinary lead pencil and cut seven notches at equal intervals on the pencil down to and around the lead, leaving it bare. A seven-point switch is constructed on a board of suitable size making the points by using screws that will go through the board. A small piece of tin or brass will do for a switch and is fastened as shown. The connections are made on the back side of the board as shown by the dotted lines. This will reduce 40 to 50 volts down to 5 or 10 volts for short lengths of time.—Contributed by Roy Newby, San Jose, Cal.



Simple Rheostat

BUILDING THE NIGERIAN RAILROAD

In the remote regions of Nigeria there is now in progress the construction of a railroad that will link up the interior with the coast at Lagos. The work is being carried out by thousands of native laborers under the control of a comparatively small body of English engineers. More than 5,000 men are



engaged in making the excavations and earthworks on one section of the line.

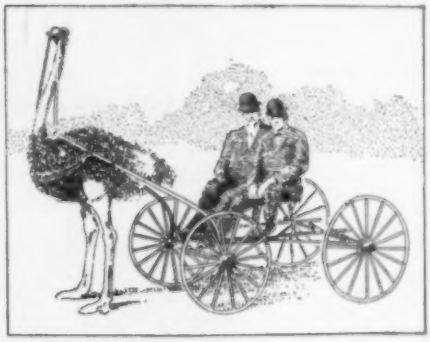
BULLDOGS TRAINED TO FIGHT IN CRUEL COURSING WHEEL

This innocent looking wheel, not unlike the treadmill in a squirrel cage, is a cruel coursing wheel, an instrument of torture used by Japanese of the Los Angeles colony in training fighting bulldogs. It is 8 ft. high, built of heavy boards and steel bars.

The dog is placed in the wheel and chained to one of the bars. The affair is then set in motion and the animal must run as fast as it can to escape being strangled. If it stops running for a moment it is dragged by the neck. For hours at a time the animal being trained

Training Wheel for Dogs

is kept on the run until ready to drop with exhaustion. Aside from developing the chest and the leg muscles, the machine serves to make a dog's temper so bad that it is ready to attack any living thing that comes near it.



AN OSTRICH RACER

This ostrich is 28 years old, has a track record of a half mile in 1 min. 5 sec., and is said to be worth $10,000. This is a speed of nearly 30 miles an hour pulling the vehicle. An ostrich, going it alone, is said to be able to cover the ground at a speed of 94 ft. per second, or more than a mile a minute. It is also claimed that the bird uses its wings when running, although, of course, an ostrich cannot fly.

THE CANNON THAT GUARD THE PERSIAN SHAH

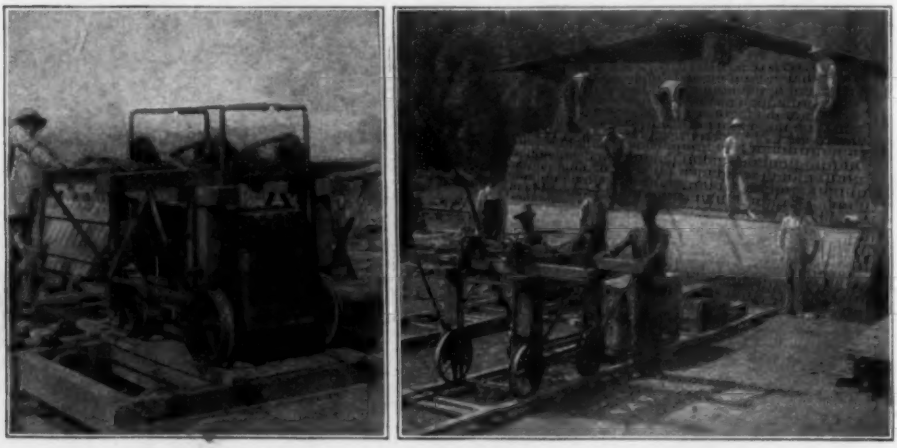
That the Persian empire did not enter upon an era of peace and prosperity when it was given a constitution and allowed a parliament is clearly shown in this photograph of four of the cannon and a detail of the Cossacks that guard Mohammed Ali, the Persian Shah. Mohammed Ali does not agree with his subjects on the question of liberty. Parliament was recently bombarded at his command and the principal deputies arrested.

A NEW TRUCK FOR BRICK PLANTS

The owner of a brick plant at Knoxville, Tenn., has invented a car that makes the handling of bricks unnecessary from the time they leave the press until they are placed in the kilns.

The car and the manner in which the bricks are carried are clearly shown by the illustrations. When the bricks leave the conveyer running from the press, they are placed on specially devised trays and the cars run over them. By pulling down a lever, four rods, one at each corner of a car, lift the trays off the ground and hold them suspended while the cars are pushed to the drying yards. The trays are there deposited and when the bricks have dried are again picked up and carried into the kilns. This arrangement does away with two of the handlings necessary with the ordinary trucks.

The survey of a railroad route to Hudson Bay, authorized at the last session of the Canadian Parliament, was commenced in September by government engineers.



Machine That Handles Brick from Press to Kiln